

The 1940 CARS

POPULAR MECHANICS

MAGAZINE



WRITTEN SO

**NOV.
25 CENTS**



SEE PAGE 654

NAME *W. H. Porter* DATE *10/12/39* MILEAGE *45400*

ADDRESS *2611 Forest Ave Detroit* PHONE *4-5400* CHECK NO. *77586*

TOWN *6-DA* SERIAL NO. *86419* CLASS ☐ *NEEDED* FRONT END ☐ BODY ☐ RUN BOARD ☐ TOP ☐ ENGINE ☐

NEEDED REPLACEMENTS ☐ LENS ☐ BULB ☐ TAIL & ALBUM ☐ REPAIRS ☐ FRONT END ☐ WHEELS ☐ MECHANICAL ☐

INSTRUCTION FOR WORK ACTUALLY ORDERED

Drain & Flush Radiator, Add Anti Freeze to Zero.

Install 6 CHAMPION-J-8 Spark Plugs.

TIME PROMISED *3.00*

ESTIMATES FOR LABOR ONLY—MATERIAL ADDITIONAL

FORM DPA 324 FOR MOTORISTS USE ONLY

A PERSONAL MESSAGE: I AM SOLELY RESPONSIBLE FOR THE SUCCESS OF THIS OPERATION. THE SUCCESS OF THIS OPERATION DEPENDS ON YOUR COOPERATION. FRACTION OF YOUR COOPERATION.

Cold Weather and Hard Starting Hold No Fears for Mr. Porter

It is the simple, inexpensive and well-rewarded practice of thousands of motorists to protect their cars against hard starting by installing new sets of Champion Spark Plugs just before cold weather sets in.

The advantages of installing new Champions *now* are manifold, and quickly apparent to the driver. They insure quick starting in coldest weather; they forestall heavy drain on the battery occasioned by hard starting; they also minimize the dangers from crankcase dilution due to excessive use of the choke—automatic or manual—which is

usual in cold weather starting and through the warming up period.

Thus it will be seen that a new set of Champion Spark Plugs is cheap insurance against temper-trying delays and needless expense. Furthermore, the savings in gas and oil quickly pay for the cost of a new set of Champions.

Insist on Champions by name, to be sure that you get the spark plugs champions use. Dependable dealers everywhere sell dependable Champions.

CHAMPION

SPARK PLUGS

IT'S THRIFTY TO INSTALL NEW SPARK PLUGS—Demand CHAMPIONS

YOU NEVER SAW SUCH STYLE AND ROOM IN ANY LOW-PRICED CAR



And never such luxury!
The 1940 Plymouth is the
low-priced beauty with the
Luxury Ride! New Sealed
Beam Headlights give 50-
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rear doors are full width at
the bottom...Steering Post
Gear Shift is now standard
equipment on all models!

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value stand out in the 1940 Plymouth!
Notice the new *spaciousness*...enjoy the luxu-
rious feel of the big Floating Power engine—
Superfinished for long-life smoothness!

It's the low-priced beauty with luxury looks
and luxury performance. Shifting is a luxury,
too. And the famed hydraulic brakes have
Superfinished drums. Try the *Luxury Ride!*

TUNE IN MAJOR BOWES, THURS., C.B.S., 9-10 P.M., E.S.T.

***THE LOW-PRICED BEAUTY with THE LUXURY RIDE
1940 PLYMOUTH!***

S.O.S.

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Authorized **CERTIFIED RE-WIRING** Service

If you have driven 15,000 to 20,000 miles without any attention to the wiring on your car, the chances are it is sending out an S.O.S. for **CERTIFIED RE-WIRING** Service. The symptoms to look for are loss of pep and power, hard starting, reduced gas mileage, insufficient illumination from headlamps, and poor accessory performance.

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cables of the correct gauge and construction, is to go to a station that provides Authorized **CERTIFIED RE-WIRING** Service. This is your assurance that the mechanic who services your car is thoroughly trained in the proper checking and replacement procedure, and that all needed replacements will be made with Packard Cable—the standard wiring equipment of the automotive industry. Drive in to an Authorized **CERTIFIED RE-WIRING** Service Station today!



LOOK FOR THIS SIGN. This sign identifies the Authorized **CERTIFIED RE-WIRING** Service Station. Since many garages are prepared to provide Certified Re-Wiring Service, but have not yet received their signs, you can ask to see the mechanic's Certified Re-Wiring Certificate, which proves he has passed his Certified Re-Wiring examination and is prepared to provide expert electrical service. Insist on genuine Packard Cable for all replacements.

AUTOMOTIVE MECHANICS: Don't miss out on the opportunity to become a Certified Re-Wiring expert. Any Packard jobber salesman will tell you how to get the Certified Re-Wiring Manual, examination blank and your Certified Re-Wiring Certificate. Or write direct. Have the owner or manager of your place of business get in touch with his Packard jobber today. Packard Electric Division, General Motors Corporation, Warren, Ohio.

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THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY

Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

November, 1939

Vol. 72, No. 5

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Exploring the Tropics

DOWN among the islands of the tropical Pacific you'll meet baby pelicans that are bigger than their parents and haven't a feather to wear. You'll read magazines after dark by the light of the phosphorescent sea. You may chance upon fish-eating bats and umbrella ants and a fantastic collection of rare birds and animals that consider you a curiosity and will walk right up to your camera, unafraid. "Exploring a Tropical Wonderland," a feature in the December issue, takes you with a shipload of students and scientists on one of the Allan Hancock expeditions among the jungle isles and atolls of the Pacific.

Shots in the Dark

HITTING a running deer a few hundred yards away is no easy job, but suppose you were told where the game was and you had to hit it without seeing it? Ridiculous, you say, but that sort of shooting is everyday work to the artilleryman. It is seldom that Uncle Sam's gunners see the targets at which they fire—with surprising accuracy. Read how they do it in next month's story, "Sharpshooting at Unseen Targets."

Next Month

WHAT about a supercharger for your car? Supercharging a racing automobile steps up its speed higher than ever. A trans-oceanic flying boat couldn't carry a pay load if deprived of its superchargers. Would your car develop more power or operate more economically if you could feed it gas and air at higher atmospheric pressures? An article in December tells what research engineers are accomplishing in their efforts to "soup up" the family sedan and the ten-ton truck.

Golden Age of Sound

NATURE might have provided us with "earlids" to shut out objectionable sounds had she foreseen our noisy civilization. She didn't, so it's up to the acoustical engineers; and already they prophesy a golden age of sound in which unwanted racket will cease, the deaf will hear and magnificent new music will be created—music already foretasted in the new electric and vacuum-tube instruments. Read a professor's forecast of this golden age next month.

Clear Track Ahead

AMERICAN railroads haul a ton of freight for less than a cent a mile, moving it forty per cent faster than a few years ago. A new air brake in eight seconds applies car brakes a mile and a half back of the engine. Next month F. E. Williamson, president of the New York Central, tells how research is keeping our railroads on top of the world. Look for the eight-page Coloroto section.

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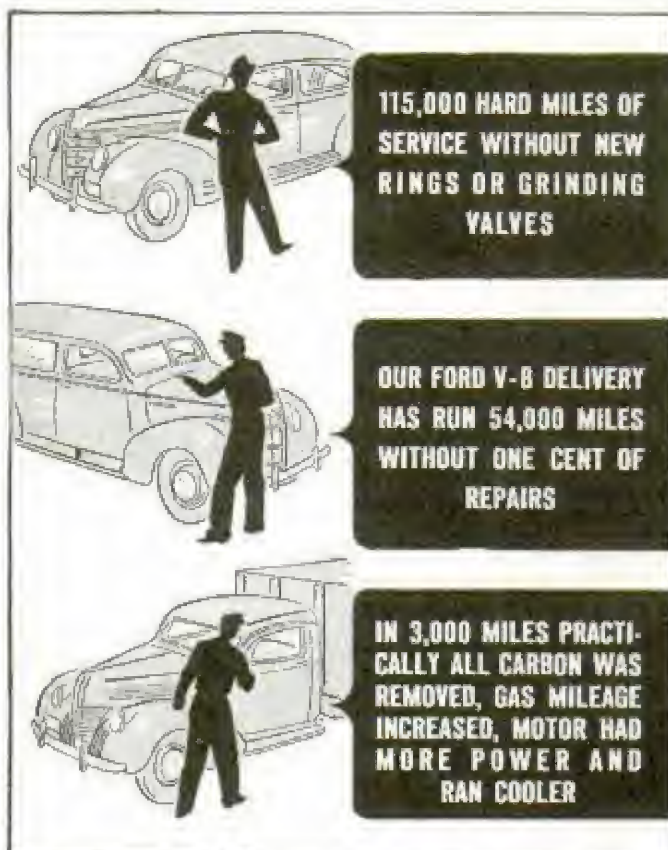
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115,000 HARD MILES OF SERVICE WITHOUT NEW RINGS OR GRINDING VALVES

OUR FORD V-8 DELIVERY HAS RUN 54,000 MILES WITHOUT ONE CENT OF REPAIRS

IN 3,000 MILES PRACTICALLY ALL CARBON WAS REMOVED, GAS MILEAGE INCREASED, MOTOR HAD MORE POWER AND RAN COOLER

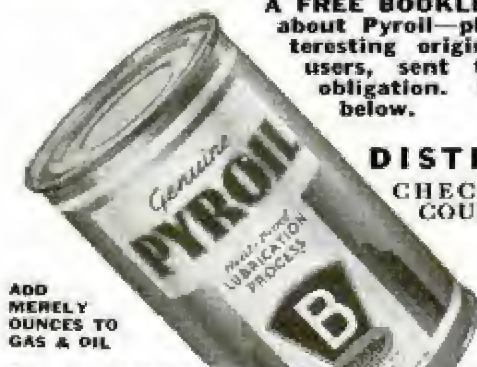
THESE RESULTS, SAY USERS, ARE DUE TO THE USE OF PYROIL

On all sides, good word arises on the performance of 'Pyroil'. "I have used Pyroil in my car since it was new and I am very pleased with the way it has kept my motor in condition," says one. Another: "I like the smooth performance Pyroil gives my car." A passenger bus line: "We are adding Pyroil to our equipment. We feel grateful to any product that will give us added protection from trouble."

Many-year users of Pyroil are good judges of its efficiency and value. We tell you Pyroil keeps engines clean. Reduces hard carbon. Prevents corrosive wear. Disperses gum and sludge. Frees rings and valves. Defeats engine "varnish." Saves you money. Users tell you Pyroil has done these things for them. You can enjoy the many benefits of Pyroil from today on if you will ask at your favorite service station or garage for a trial treatment. Merely a few ounces in gas tank and crankcase at a trivial few cents' cost. Then, just see what a difference there is in your car's performance. Do this today! Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 511 Pyroil Bldg., LaCrosse, Wisconsin, U.S.A.

A FREE BOOKLET telling you all about Pyroil—plus copies of interesting original letters from users, sent to you without obligation. Mail the coupon below.

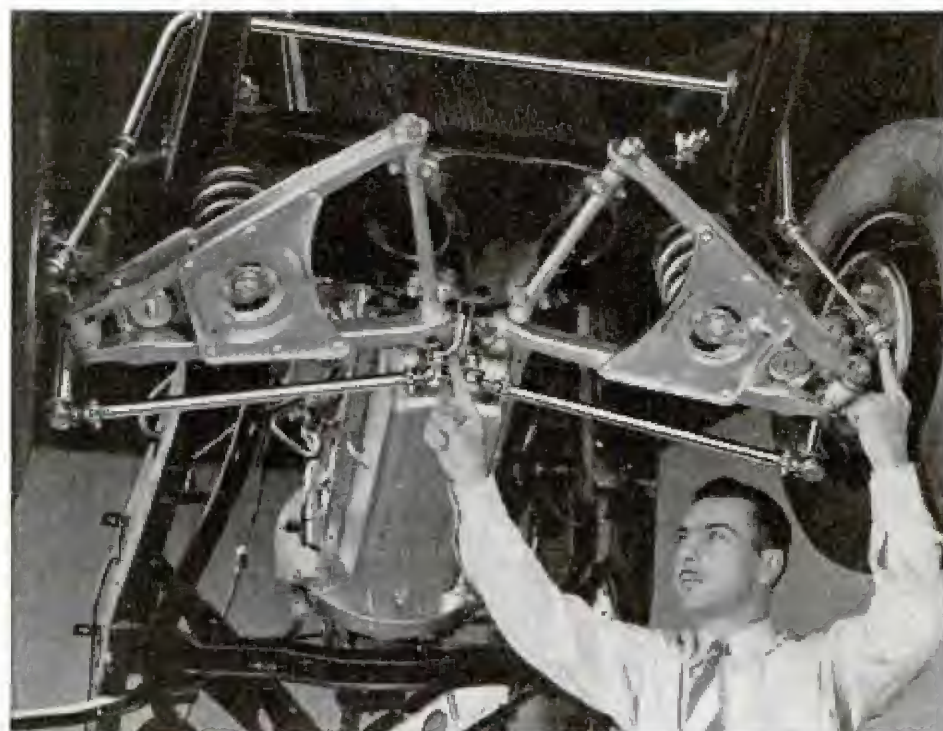
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The Ride of Your Life Waits for You IN ANY 1940 HUDSON



(At left) An engineer points out two of the features of Hudson's new independent front wheel suspension that are new to the industry!

His left hand indicates Hudson's own Auto-Poise Control—a patented invention that automatically helps keep wheels straight, even if a tire blows! For the first time, finest independent front wheel coil springing is given the benefits of *positive wheel control!*

His right hand indicates Hudson's Center-Point Steering, most accurately designed system known... used up to now only on very costly cars. Sweetest handling, easiest riding car you ever drove!

Now . . . in the Lowest Price Field . . . a Car that Looks, Rides and Drives like Twice the Money

Today, for a rock-bottom price, you can own a car that makes heads turn to see more of its beauty. A car with more roominess, more genuine luxury, more power, than the lowest price field has ever seen before. This car is the new Hudson Six, most amazing lowest priced

car ever built, pictured below. And its crowning wonder is that you'll find it one of the most economical of all cars . . . in gas, in oil, in every way. Visit the nearest Hudson showroom . . . see and drive the new Hudson . . . before you buy any 1940 car!

*Car shown is new Hudson Six DeLuxe Touring Sedan, \$806**

**NEW LOWER PRICES
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\$670

**delivered in Detroit, equipped to drive; including Federal taxes, not including state and local taxes, if any. Low time payment terms, with new Hudson-C. I. T. Plan. Prices subject to change without notice.*

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Proved by ten years' industrial use, Casco Flexible Cement is now available in handy tubes for workshop, home, school and office.

Bonds a wide variety of surfaces—metal, paper, glass, wood, plastics—a new, quicker, cleaner way. Forms a *flexible* bond that resists heat, moisture, expansions, even shocks!

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...on furniture, cabinets, boats, etc... use Casco Powdered Casein Glue. Easy to mix. Used cold. Resists moisture, heat and rough usage. 10c to 65c at Hardware, Paint and Lumber Dealers.

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Helps woodworkers from beginner to Master Craftsman. Contains a list of free and low-cost booklets offered you by leading experts on Tools, Finishes, Sharpeners, Cabinet Woods and Veneers, Project Plans and Workshop Clubs. First book with *all* this information. Mail coupon now for your copy.

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WHICH OF THESE MEN IS YOU?



Is This You?

OR

Is This You?



1. "My name is Stark. I'm never late mornings. I get back promptly from lunch—often work overtime cheerfully. I carefully do every single job they give me and in six years I have done each job so many times that I'm letter-perfect! Only one little raise so far, but some day I ought to get a good one. I'm probably the steadiest, most loyal employee in the whole office. One of these days the boss will realize that I'm the best man who ever worked on this job. *Then* I'll show these other fellows a thing or two!"

2. "My name is Baker. I've only been here a year, but the jobs they give men like Stark and me are too easy. In three months I saw I could never get far ahead on routine work like this. So I began to look for ways to increase and improve the work in my department. I'm taking home-study training that's helping me a lot. My boss heard about it and complimented me. Next month I'm going to be made Assistant Department Head at 40% more money. After that—well, we'll see. But you can bet I'm still studying!"

DON'T you recognize both these men in your office? One is a slow plodder—the other an energetic go-getter. Stark thinks of himself—Baker, of his company.

Stark runs along comfortably in a rut—*hopes* for a big raise. Baker pulls himself out of ruts—*gets* a big raise. And goes right on training for *another* one!

It's men like Baker who turn to LaSalle business training because of what it *gets* them! And they know it gets them *plenty* because the proof is plain to read in the grateful letters—and the successful lives—of thousands of LaSalle graduates.

You too can join the ranks of the "comers" like Baker if you'll "train on the

job you've got—to get the job ahead!" It all depends on you—the height of your ambition and your readiness to investigate, then study systematically and seriously.

The LaSalle Success Road is cleared and ready for earnest adults—has been traveled for thirty years. Its first sign-post has always been a man's name on a coupon like the one below.

It costs absolutely nothing to send such a coupon. But sending it may mean the turning-point in your whole life. Mail it! At least *find out* about LaSalle's road to better jobs—more money—success! There's no time like *NOW*!

LASALLE EXTENSION UNIVERSITY, A Correspondence Institution
Dept. 1164-R CHICAGO

I am ambitious like Baker. Tell me how I can prepare for larger success—and send me your free booklet on the field I have checked below:

☐ Executive Management ☐ Law: LL.B. Degree ☐ Salesmanship
☐ Accounting ☐ Traffic Management

Name.....Age.....

Position.....

Address.....



LaSalle EXTENSION UNIVERSITY
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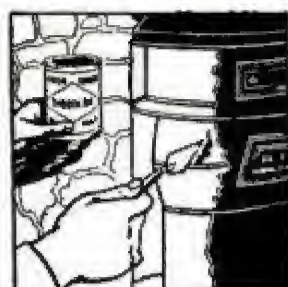
TIME SAVING ALONE

may urge repair with

SMOOTH-ON No. 1



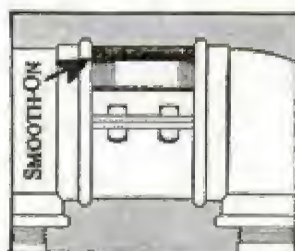
INFINITELY more vexing than the repair of a cracked heater, leaky joint, opened seam, or loosened part are the annoyance and possible damage before proper working conditions are restored.



A—Sealing crack in a heater with Smooth-On

Usually a leak can be stopped, a loose part tightened, or a crack patched with Smooth-On without taking anything apart. The Smooth-On is easily applied without heat or special tools, solidifies quickly, and makes a seal or joint that has the strength and durability of the adjacent metal. Any householder or handy man can do the work quickly, at big savings, and with full assurance of an efficient and permanent repair.

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B—Stopping leak at pipe threads

is a can of Smooth-On No. 1 in your workbench. With these precautions, you will be well prepared when the unexpected happens.

Buy Smooth-On No. 1 in 7-oz. or 1 or 5-lb. can from your hardware store or if necessary from us.



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IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.



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• "I work in the shop every day. And a couple of hours every evening, I study. Study what? I don't mind telling you — an I. C. S. Course! Take it from me, shop practice and home study go together. When you combine them, you're headed for more pay and a brighter future!"

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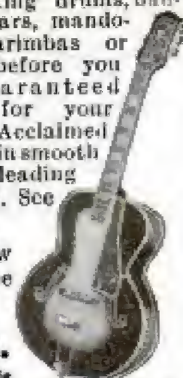
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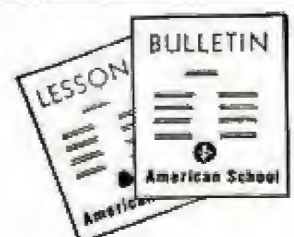
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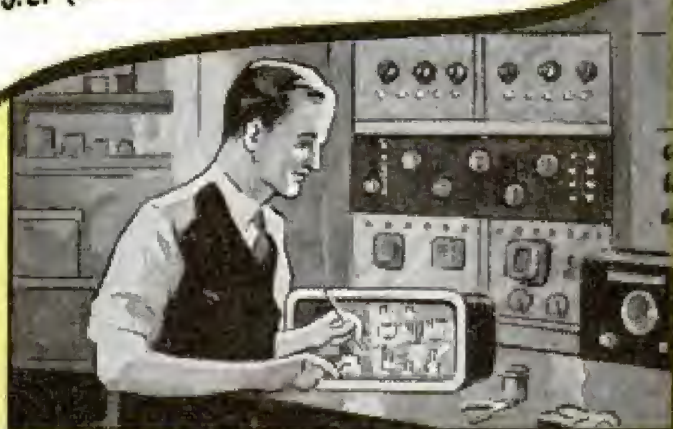
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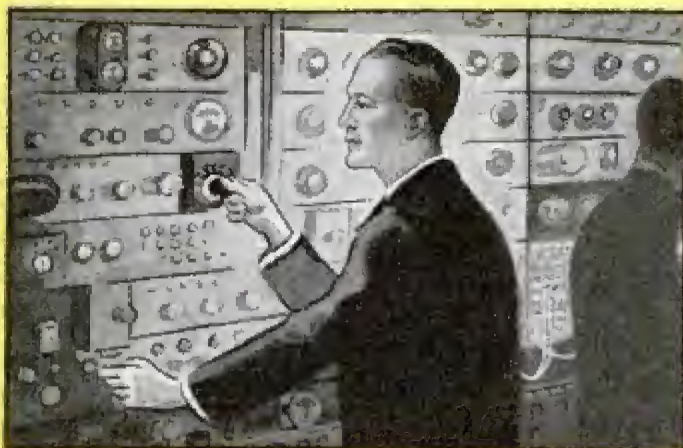




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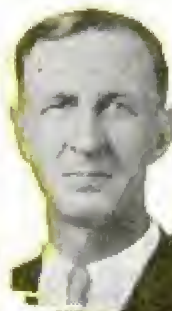


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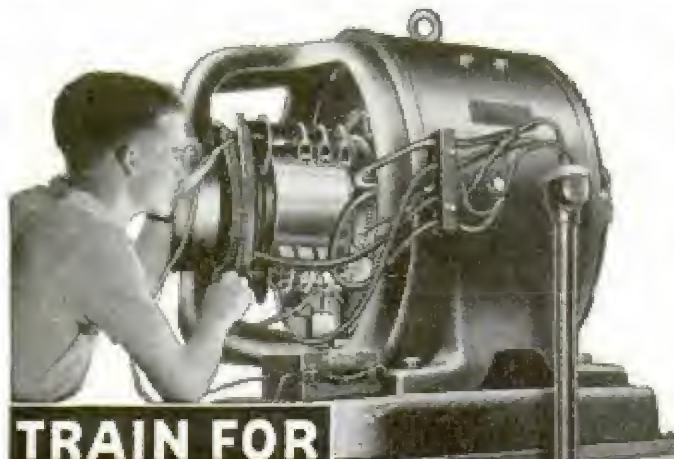
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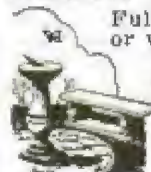
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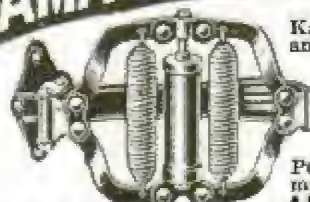
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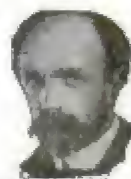
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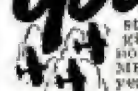


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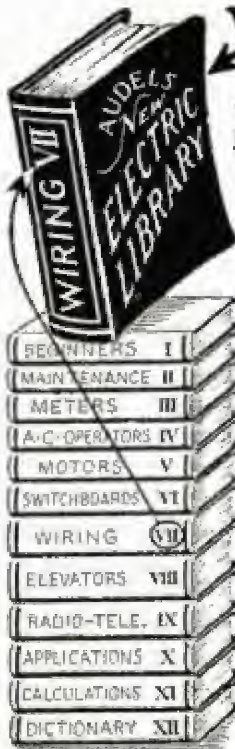


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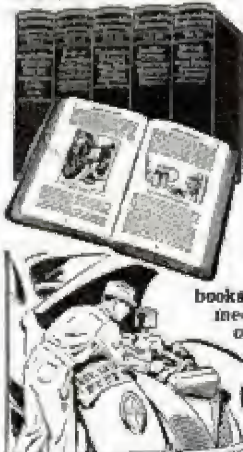
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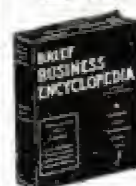
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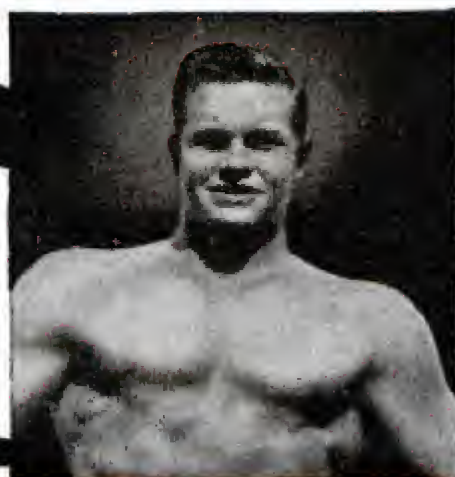
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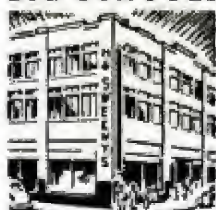
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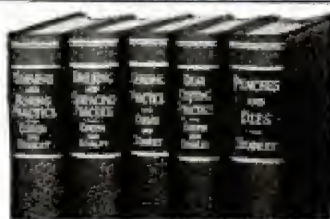
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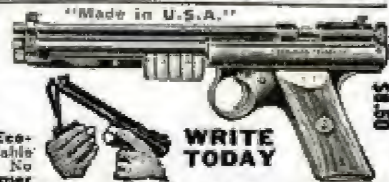
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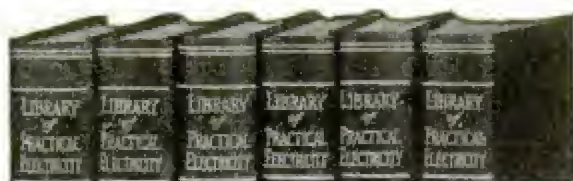
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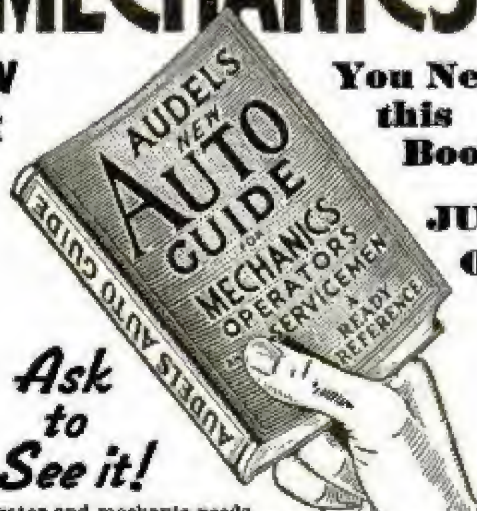
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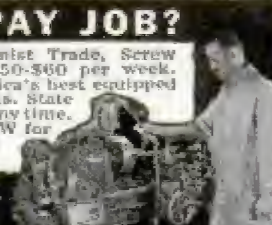
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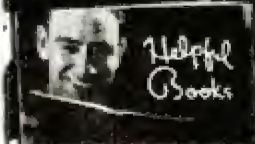
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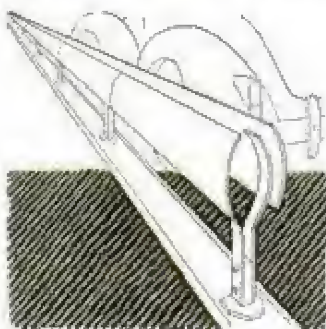


SOMETHING new in the bicycle field—a power-saving hub—has been patented recently. When the power is applied, an internal gear arrangement carries the static pressure of the load forward of the hub's center, giving the road wheel an immediate start. In exact proportion as the road wheel meets opposition, from the gradient



or other means, the load is brought still farther forward. The inventor claims that the power required to move the load within the hub is much less than that needed to turn the road wheel by torsion at its center; also that when the load is so shifted in the traveling direction, it has the effect of a moving wheel, resulting in quicker getaway and easier propulsion than if the wheel is moved in the usual manner.

INCREASED safety on the highway is the purpose of a newly patented center road-dividing guard. Curved guard rails, supported by spring steel legs, separate the lanes of the road, thus keeping automobiles, trucks and buses from meeting head-on or side-

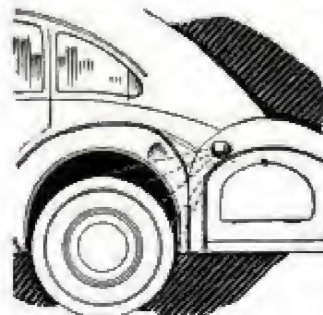


swiping each other. The plates, which present an outward curved surface to the vehicle, are spread slightly. Under impact, the plate struck by an auto is forced inward and against the companion plate, which helps to absorb the shock. The guard occupies little space.

GREATER speed and more protection from dirt and mud picked up by the front wheel are provided by a shield for a pedal car. Patented recently, the pedal car closely resembles a bicycle, except that it has two rear wheels, between which the seat is mounted. The shield forms a body, then extends upward to form a wind barrier. The shield is streamline, enhancing the appearance of the sports vehicle.



SERVICING a tire on an automobile fitted with the low-hanging modern fender and wheel skirt would be easy if a newly patented fender were adopted. The fender has two sections, one permanently attached to the side of the car, the other constructed to swing open on a hinge at the rear end to expose the wheel. A recess in the two sections contains a light for illuminating the wheel, and a pocket in the lower edge of the swinging half may be used for storing tire-servicing tools.



(Continued to page 34A)

A Sensational New Business

That May

Sweep You to Riches

This is undoubtedly the most amazing money-making opportunity ever offered to the readers of this—or any other—magazine. It tells how any ambitious, level-headed man can quickly establish a remarkable new kind of business that may pay a steady net cash profit of \$40.00 a day—a business that offers unlimited opportunity, rapid expansion—a business in which you can employ others to work for you and run your daily profits up as high as you want them to go—a business that may make many men independently wealthy within the next few years.

HERE, briefly, are the "high-spots" of this thrilling new business that should create "fortunes" for those with the vision and foresight to get in on the ground floor now:

- 1** An utterly new product with a natural, staple demand and big repeat business, yet one that has all of the appeal of a novelty.
- 2** Requires no house-to-house canvassing or selling. You simply manufacture. Every store, tavern, club, or any establishment where any sort of food is handled are your immediate customers.
- 3** Starting with one unit alone you have a capacity to enable you to make \$42.00 profit a day selling at wholesale.
- 4** An amazing product that can be manufactured by special secret process by only one mill in the country. This mill, one of the largest of its kind, manufactures the product exclusively for us and our operators. No one else can make it or buy it. This means your protection from cut-throat price competition.
- 5** All year around business; no slack seasons.
- 6** Tremendous natural demand in every community, whether large or small.
- 7** Absolutely no experience needed to be successful.
- 8** No expensive equipment needed. Your whole investment will be less than your first week's potential income.

This is truth; not fiction—fact; not theory. To the best of our knowledge, no other business in America offers one-tenth the opportunity for profit and independence.

Vision Turned to Reality

A short time ago, this amazing money-making product was nothing more than a dream—today it is a reality.

It is a practical, tried out, thoroughly tested business!

Every detail has been perfected—complete and tested plans of operation worked out—all necessary equipment ready to turn over to those who are prepared to develop this new "gold mine."

No Selling—No Canvassing

Do not confuse this new product with anything you have ever heard of before. It is not a potato chip, not candy, not a cheese chip, not a paste preparation—but a natural product that comes from the sky, from the ground, and from the air. It is not like anything you ever saw or heard of, or imagined. The simple truth about it is stranger than your wildest dream. And you can be the first to supply this great demand.

\$100.00 a Week, Net, to Start

According to accurate figures, the very minimum of the first operation should produce a net cash profit of at least \$100.00 a week. Since it is possible to make \$42.00 a day, you can see that it would take only two and a half days of full operation to make a profit of \$100.00. This, we figure to be a minimum. We would not be interested in appointing men who could not make at least that much every week. Then, as demand increases, other men can be put to work for you and you can double, triple or quadruple your weekly profit as steady repeat business develops.

No Expensive Equipment

Ordinarily a proposition as big as this would require the purchase of expensive equipment with which to manufacture this remarkable new product. But in this case our manufacturing process has been so simplified that we can furnish you with everything you need to start off making a profit the very first day—all for an investment of \$150.00.

No Experience Needed

Absolutely no experience is required to quickly become successful in this thrilling and fascinating new business. We tell you how to start—how to establish yourself quickly—how to operate the business the very day you are ready to go. We furnish all necessary plans, systems and equip-

ment. Any man with ordinary intelligence and a real desire to succeed is bound to make money.

Small Town or Big City

Another feature that makes this business unlike any other is that it can be operated anywhere. No matter where you live—in the smallest town or the largest city—you can establish yourself practically over night and start enjoying an independent income at once. From the foregoing facts, you can readily see that this is not a business for the timid operator who is satisfied to make a bare living, but for the wide-awake, aggressive go-getter who wants to see his energy and enthusiasm produce the greatest possible results in the shortest possible time.

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To all such men, we request permission to mail an unusual and complete presentation. After you have read the amazing facts and figures in this presentation, then you can decide whether or not an initial investment of \$150.00 is too much to ask for a complete business that can bring back that investment in the first three days of operation, and then continue to pay as much as \$252.00 a week net profit for one man operation, and up to as high as a thousand a week net profit to those men who have the ability to organize and direct other men.

Act Quickly

There is no time to lose. Today this proposition is new. Tomorrow it will be a little older—next week a little older still. So get the facts without a moment's delay. It's the newcomers in any enterprise of this sort—the "ground floor operators"—who always reap the richest rewards.

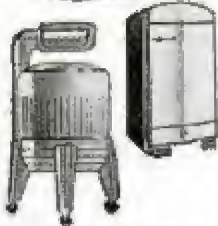
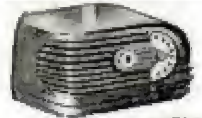
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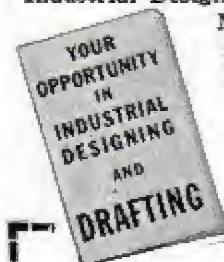


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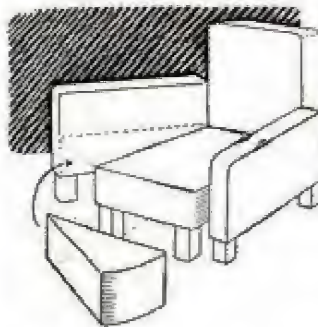
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POPULAR INVENTIONS

(Continued from page 32A)

FOR enlarging its capacity, convertible furniture has been patented recently.



One piece consists of an upholstered chair with the usual side arms, at least one of which is arranged to swing away from the seat portion. Thus, an extra seat section, constructed in triangular

shape, may be inserted into the space and the swinging arm pushed into place against it. The extra seat is built the exact height of the regular seat. When the extra seat section is not required, it may be used as a foot and leg rest.

PRACTICALLY everything for the camper's culinary needs is incorporated into a handy kit patented recently. It contains plenty of pots, pans, plates and food storage utensils, all packed in a con-



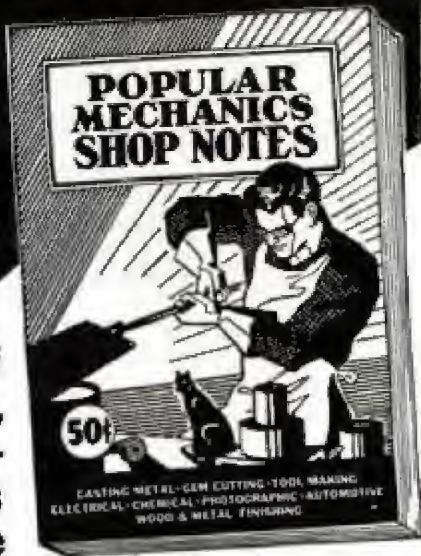
venient container. At the top is a two-burner camp stove which folds for packing when not in use. The unit is expected to find considerable use among campers and picnickers. It probably will go on the market soon.

(Continued to page 55A)

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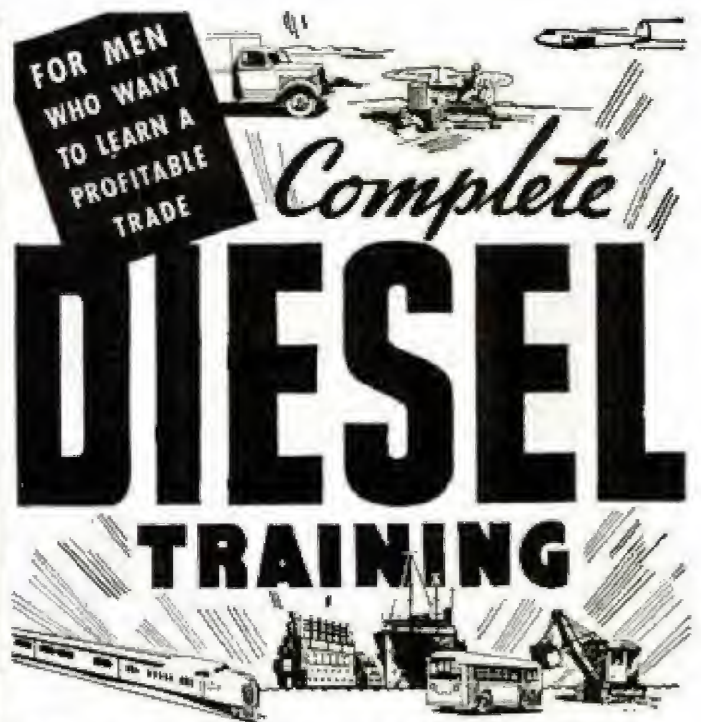
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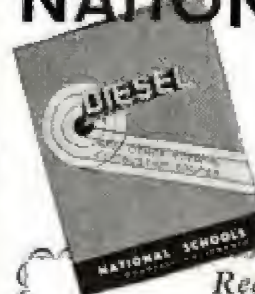
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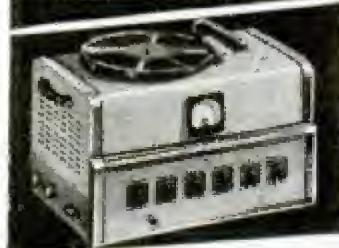
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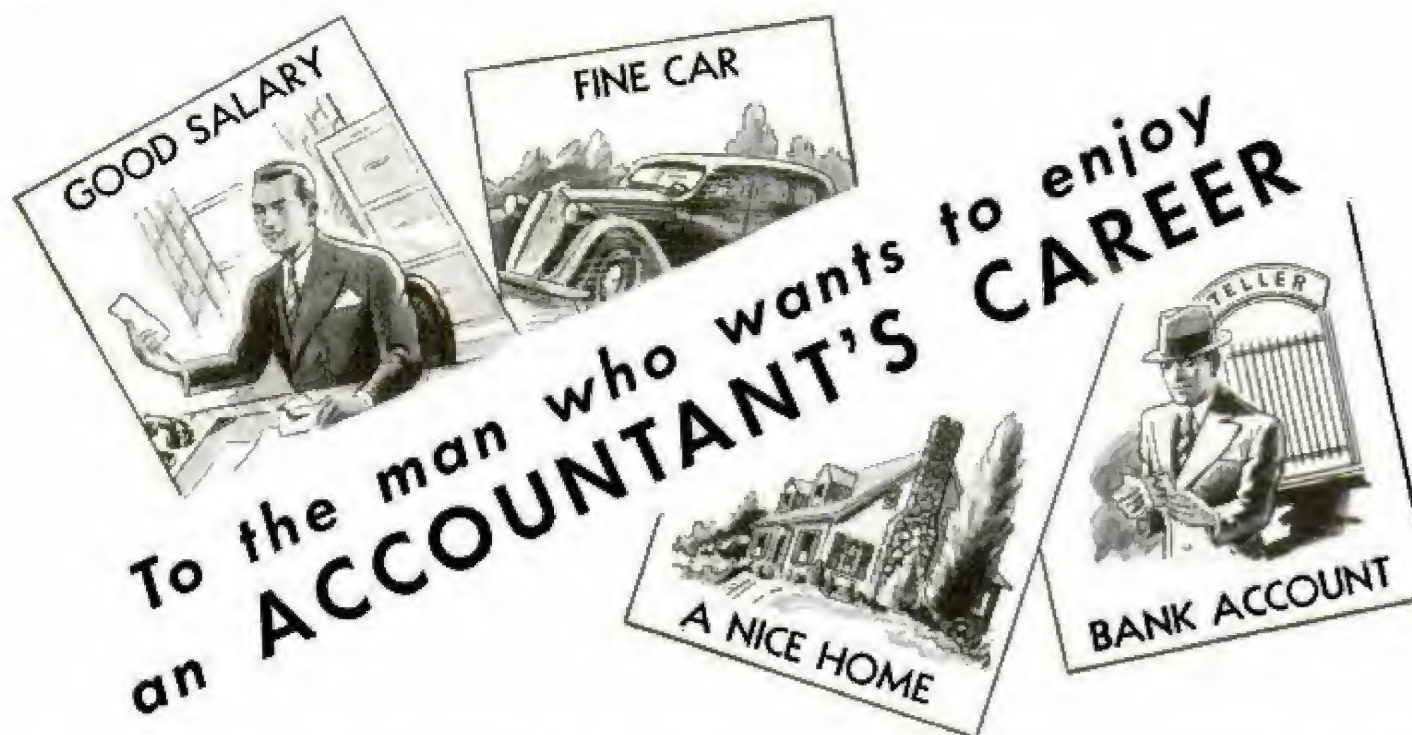
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HOLLYWOOD Match covers included collection 110 all different \$1.00. Coverservice, Fellows, Calif.

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NOTICE—Selling by mail is highly profitable, if you have a new, legitimate and good item. We have it. Our new valuable and different information folio is needed by millions, recent copyright. Not trash, bunk or schemes. Nothing like it. Large profit for mail dealers. Sample \$1.00. Particulars free. Royal Keystone Enterprise, Box 192, Dept. 11, Berryville, Ark. Copyright owner. Don't delay if you are interested in making money.

FREE—300 Wonderful business, mail-order and home work moneymaking offers. Lewis Company, 828-D Carpenter, Oak Park, Ill.

TREASURE Finders? Read Goldak advertisement on page 134A.

WANTED—Factory representatives for complete Turkish bath outfit for home use. Light, streamlined, compact. Retail \$9.95. Write today for our proven sales plan. Perspirator Mfg. Co., First and Utah, Toledo, Ohio.

COLOR Concrete with chemicals. Stucco-Rock. Cement artistry. Benches. Wishingswells. Spin concrete pottery. Miniature castles, watermills. Coldglaze, water-paints, marbling. Sample 10c. Hollywood Cement-Craft, 4527 Wonderland, Hollywood, California.

LEARN Account collecting. Good income; quick results. Interesting folder free. National Collectors Association, Newark, Ohio.

QUICK Income! Fast-growing business creates lasting independence; no canvassing. Service, Drawer 339-5, Butte, Mont.

EARN Extra money at home. Increase your income at home by new, simple Wentworth Tempera Color method. We instruct you and supply you with work. Write today for free booklet. Wentworth Pictorial Co., Ltd., Dept. 3, Hamilton, Ont.

GOOD Paying business, plating auto parts, reflectors, bicycles, bath fixtures, mirrors, by late method. Small investment brings big returns. A permanent respectable business in your own community. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

PROFITABLE Business. Personal, business stationery 50% profit. Garfield Art Studio, Crown Point, Ind.

100 **PROFITABLE** Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

NEWEST. Uncommon specialties sell best! I'll tell you how to easily make them, in an independent business yourself and have hundreds selling them for you. Miller's Chemical Laboratory, Tampa, Fla.

BE Rich. Make 900% profit bottle vanilla extract. Free labels. Sharp, 914 Lexington, Cumberland, Md.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; hand soap 2c pound; and ten fast sellers. Sample 25c. Details free. Western, 401 Climax Bldg., Cleveland, O.

GIANT Mail, opportunities, added income, ideas. 68 page magazine 10c. Katz, 4254 N. Kimball, Chicago.

ADVERTISERS! 1,800,000 Mail order circulation. Inch advertisement, \$15.40. "Get results." 20 newspapers, 18 words, \$6.50. Diener-Dorskind, 1474P Broadway, New York.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big wholesale season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

"SCHEMER" Magazine, Alliance, Ohio. (41st year) prints schemes, tips, opportunities, formulas; winners: \$10,000—\$25,000 reported. Year, \$1.00. Now get acquainted; trial six months only 30c.

MAKE Money by mail, the way we do. Free information. Maywood, P-1107 Broadway, New York.

LIQUID Marble—anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

107 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

SUCCEED With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. E. Eifco, 438 N. Wells, Chicago.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

A LIFETIME Business you can run at home! No selling. Grow giant, patented mushrooms, in cellar, shed. We pay cash for all you raise and supply everything necessary to start you in business. Write today for free book. United, 3848 Lincoln Ave., Dept. 59, Chicago.

ELITE Collection of business plans, contains 107 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

1059 WAYS To start a profitable business. Get Popular Mechanics book of modern formulas and methods for practical specialty manufacturing. Price only \$1.25 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

MONEYMAKING OPPORTUNITIES

MAKE More money! "Prosperity" shows how. Now 64 pages. Sample, dime. Size-moore, 4917 N. Kostner, Chicago.

BETTER Yourself. Present position—new job—or your own business. Advance, prosper, succeed. Startling free details. Write, Manager, VR Mfg. Company, Detroit Lakes, Minnesota.

INCREASE Your income, we'll show you how. Particulars free. Ace Publishers, P.O. Box 176, Astoria, N. Y.

RAISE Rabbits, guinea pigs, white mice, for laboratory and other purposes. Big demand. Interesting, profitable work. Send stamp for particulars. Breeders Service Bureau, 201 Richardson, Hanover, N. H.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write Sprinkle, Plater, 287, Marion, Indiana.

MILLION Articles. Buy wholesale. Valuable directory 10c. Ideal Service, D-11, Park Ridge, Ill.

EARN Money, year round, inventing toys, games, novelties. Special markets. Booklet free. Hendrickson, Argyle, Wis.

MANUFACTURE. Sell furniture polish—Formula \$2.50. Linoleum cleaner polish \$3.00. Auto dry cleaner polish \$3.50. Three formulas \$7.50. Simmonds Co., Rt. 4, Box 3623, Sacramento, California.

APPLY For tropical positions. Write for list of companies with branches in Hawaii, Philippines, Panama, etc. World Tropics, Dept. C-1, Box 1243, Birmingham, Ala.

205 MONEYMAKING Opportunities. Start own business. Home, office, etc. Particulars free. Stamford, 3762-a Broadway, New York.

BUYERS Guide—Also latest money making opportunities. Wetzel, Valhalla, N. Y.

MAKE Money by mail. Steady income. Samples and particulars 10c. V. Messick, Box 217, Camden, New Jersey.

BOOK. 100 Opportunities, plans 25c. Literature 3c. Morelle, 130 N. State, Chicago.

START Your own business. Plans 25c and \$1.00. Ned Piermarini, 46 Lincoln Terrace, Leominster, Mass.

MAKE Cuts—Print greeting cards, book-plates, etc., without press. Instructions \$1.00. Paul Williams, Carmel, N. Y.

MAKE \$3.00 Daily. New profession. No selling. Write Garden Publishers, Adel, Georgia.

START Own mailorder business. Send 25c for big folio, "How to Sell by Mail," by expert. Benty, 1741 Melrose, Chicago.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, GS-1142 Sunnyside, Chicago.

KEEP Dollars received supplying, by mail, satisfying employment information—millions jobless. We fill your orders. Stamp, details. Co-Operative Service, 77 Swan, Buffalo, New York.

PREPARE For artists job. Big pay. Simple for anyone. Illustrated course—nude figure drawing 50c postpaid. Hart Studios, 7939-P South Shore, Chicago.

900% PROFIT. We teach you. Stamp appreciated. Box 747, Muncie, Indiana.

BE Independent. Start mail order business. Over 100 ways. Particulars free. Campbell Service, 3231 Dupont, North, Minneapolis, Minnesota.

MONEYMAKERS! Barbecued frankfurters formula (dime). Sensational "Holland-Inn" hamburger proposition included. Davis, Box 1484-MP, Clarksburg, West Virginia.

BRAINS For you. 36 page magazine, plus opportunities 10c. Rab Publishers, Cincinnati.

FREE—Speedex candid type camera, carrying case, 2 rolls film, for two hours spare time. Postcard brings details. Veltex Company, Dept. MP, Birmingham, Alabama.

FREE—300 Wonderful business, mailorder and home work moneymaking offers. Lewis Company, 828-D Carpenter, Oak Park, Ill.

MAIL Order business that pays. John Rodakowski, Springfield, Oregon.

400 "UNIQUE" Money making opportunities. Particulars free. G. Distas, Fillmore, N. Y.

TREASURE Finders? Read Goldak advertisement on page 134A.

BE A professional scrapbooker. Big fees. Unlimited opportunities. Can be done at home. No competition. No capital needed. Write postcard to Scrapbookers Guild, 59 Park Place, New York, N. Y.

BOOKKEEPERS—Increase income with inexpensive new bookkeeping service. Robertz, 3701 East Hancock, Detroit.

GOOD Paying business, plating auto parts, reflectors, bicycles, bath fixtures, mirrors, by late method. Small investment brings big returns. A permanent respectable business in your own community. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

"MONEY By mail"—Latest plans, formulas, ideas, opportunities. 25c. Roberts, 3705 East Hancock, Detroit.

BIG Mails of opportunities: imprints, new offers, mailorder propositions, sample mailing free. Harvey Teeple, Decatur, Indiana.

"100 TO 1" You will like these "unique and unusual" propositions. "3" real money makers. Details free. Original, Box 1792, Houston, Texas.

KEY Check stamping outfits. Emblem key checks, key rings. Catalog free. Sample name and address 25c. Social security plate name number 15c. Kemp & Company, 463-P East 178th St., New York.

MOULDS. Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schlercke, 645 Spencer, Ghent, N. Y.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

WHOLESALE Sources. 500,000 articles. Free directory. Maywoode, 1107 Broadway, New York.

ACCOUNTANTS And bookkeepers. Real profit from new type bookkeeping service. Write Asco, Box 1468, Springfield, Mass.

1001 WAYS to Use Concrete. Send for large free illustrated folder describing new Popular Mechanics book covering every known use of concrete for the home, farm, building, business and industry. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

FORMULAS, PLANS, ETC.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Avenue, Syracuse, N. Y.

FREE Formula catalog. Accurate analysis. Research. Western Chemical, Salem, Oregon.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 410, Park Ridge, Ill.

FORMULAS For live selling products. Palmer Specialties, Sandwich, Ill.

ONE Dollar for a formula that will clean the plates in your battery. It will take a charge in car or charger, will last three to six months longer. Cost about three cents per battery. Chandler Oil and Batteries, Box 214, Plainview, Texas.

PROFITABLE Formulas. Information free. Rochambeau Laboratory, 339 E. 19th, Paterson, N. J.

PRODUCTS Manufactured, bulk or packed. Write Manufacturing Chemist, P.O. Box 768, Waco, Texas.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, SD-1142 Sunnyside, Chicago.

10,000 BIG-MONEY Formulas, processes, secret recipes. Huge 900 page book, \$1.50 postpaid. Catalog 3c. Adams-Brown Company, Chestnut Hill, Massachusetts.

FORMULAS—All Kinds. Real money-makers. Lowest prices. Catalog free. Clover Formulary, P-11, Niles Center, Ill.

MAKE Chemical specialties without machinery or heat. Approved big sellers in daily demand. New plan tells how. Brown Company, 47 North Sixth, Reading, Penna.

10 FORMULAS 10c including "Traders Gold" the new marvel. Alma Company, Hunter, Ark.

HERE'S Headquarters for newest, tested, guaranteed highest quality formulas for every modern requirement. Analysis-research. Prices nominal. Miller, Chemist, Tampa, Florida.

REAL Moneymaker. Make, sell luminous paint. Simple, harmless. Formula, instructions \$1.00. Sample 10c. Gordon Laboratories, 1265-C Broadway, New York.

THAXLY Formulas for perfect products. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

CHEMISTRY

FREE Catalogue. Chemistry, mineralogy, biology, microscopes, telescopes. Tracey Laboratories, Evanston, Illinois.

CHEMICAL—Technical books. Catalogue for stamp. Kraftmen's Press, Coscob, Conn.

JOIN—American Amateur Chemists Society. Journal, prospectus, 10c. Haslett, Mich.

CHEMICALS In 5c quantities. Catalog 5c. Fleischler's Laboratories, Everett, Mass.

SPECTROSCOPE For quick chemical analysis \$2.50. Kutting Sons, Campbell, California.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS. Laboratory, glassware, apparatus. Send 3c for catalog CPI. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

HELP WANTED

M. M. earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 60, Chicago.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, raincoats, uniforms, etc. Sales equipment free! Experience unnecessary. Nimrod, 4922-BQ Lincoln, Chicago.

STEADY Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNeas Co., Dept. 329, Freeport, Illinois.

SALARIED Positions—\$2500 yearly and up. Let us find one for you. Write for valuable information. Executive's Promotion Service, (16), Washington, D. C.

\$30 WEEKLY. Grow mushrooms. Cellar, shed. We buy 35c lb. Mr. B. made \$270 spare time. World's largest company of its kind. 40 page book free. Mushrooms, Dept. 701, 2019 Second, Seattle, Wash.

BIG Sparetime profits taking subscriptions—all magazines. Pines, W-583 Monroe, Brooklyn, N. Y.

AGENTS WANTED

A VALUABLE Gift—Watch, candid camera, dish set, or other gift of your choice—is yours in addition to doubling your money on easy selling of our 1939 master box of Christmas cards. This 80-piece box costs you 25c; sells itself quickly at 50c. Contains 16 artistic French-fold cards, 16 matching envelopes and 48 sparkling NipArt Christmas seals. Get free sample and our gift plan at once. Be first in your community. American Card Co., Box C-95, Lancaster, Penna.

\$1 STARTS You in business selling outstanding line ties, boxed novelties. Over 100% profit. Silk lined ties, \$1.50 dozen, sample 15c. Slide-On-Ready-Tied ties, \$2.50 dozen, sample 25c. Write today for descriptive wholesale catalog, prices, free sample materials. Philip's Neckwear, 20 West 22nd, Dept. P-3, New York.

MEN And women, big profits. See the brand-new Nifty Shoeholder. Nothing like it at any price. Holds any standard size shoe for cleaning, dyeing or polishing. Every home, shine parlor, barber shop and shoe store a prospect. Made of oak and steel. Postpaid sample with instructions, \$1.00. Nifty Shoeholder Co., 7280 Lindell, St. Louis, Mo.

POLMET Polishing cloth removes tarnish from metals without the use of liquid, paste or powder. Agents say it sells like "hot cakes." Retail 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

STEADY Profits: New improved wax furniture polish. Private brands: your name. P.O. Box 247, Newport, R. I.

YOU Ain't seen nothing till you've seen the patented Handynife. Sample 15c. (No postcards.) Paramount Specialties, 121-M East 27th, New York.

NEW Potato peeler. Sells like wild. Peels, shreds, slices, grates. Saves hands, time, food. Samples sent on trial. Rush name. Kristee, 112, Akron, Ohio.

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, R-37, Greenfield, Ohio.

NEW Inventions. New Products. Opportunities. Paramount Produx, 18834 Marx, Detroit.

ATLAS Window sign letters. Large sizes—penny each. Get beautiful samples. Atlas, 7943 Halsted, Chicago.

SELL New and used clothing from home, auto or store. Men's suits 96c. Shoes 8½c pair. Dresses 21c. Hundreds big bargains. Catalog free. S&N, 440-A East 31st, Chicago.

BIG Money—Applying gold initials on automobiles, luggage, etc. No experience needed. Samples free. Gold Letter House, Tyler, Texas.

500% PROFIT With new perfected (1940) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 10c. New Method Co., Box PMH-82, Bradford, Penna.

BIG Money for you in small route business. Can be handled spare time from home. Equipment free. Operate on our capital. No experience needed. Earnings start at once. Don't answer unless sincere and dependable. Zanol, 6121 Monmouth, Cincinnati, O.

DRESSES 10c. Hats 40c. Shoes 50c. Many other bargains—Used merchandise. Free catalog. Send name on postcard. Fairmount, 160PM, Monroe Street, New York.

BEAUTIFUL Bird pictures handmade with genuine feathers. Sell on sight! Large profits! Free particulars. Samples 10c stamps. Marquez-PP, Apartado 1176, Mexico City.

BUSINESS Proposition resilvering mirrors, autographs, reflectors, making chipped glass signs. Write Sprinkle, Plater, 128, Marion, Indiana.

NEW! Amazing! Double action polish of thousand uses. Field unlimited. 25c for sample and plan. Glo-Kleen, 2444 N. 3rd, Milwaukee, Wis.

SELL Christmas signs. Write today. Special Kut Signs, Sidney, Ohio.

MEN! Sell the Automatic Gas Lighter. No flint or refill needed for 5,000 lights. Just hold over any gas jet or stove and it lights it. 15c each, \$1.20 dozen, \$5.04 six dozen, \$7.85 gross, \$15.50 two gross. A. Macaluso, 178 E. 106 St., New York City.

YOU Get \$5.00 cash for distributing 100 samples. 100% profits from sales and repeat orders. 10c brings full details. Earlrich and Co., Cedarville, Ohio.

LOWEST Prices—Reversible topcoats. Tremendous profits. Yale Clothing, Meriden, Conn.

SELL Charlie McCarthy clocks and carded merchandise. Dixie Supply, Rosslyn, Virginia.

BUILDERS Reel, many uses, fast seller. 200% profit. Sample dime. No-T! Co., 3919 West Pine Blvd., St. Louis, Mo.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, raincoats, uniforms, etc. Sales equipment free! Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

CHRISTMAS Cards. Sell 50 imprinted \$1.00. Free samples. Lincoln Press, 220 Hartwell, Fall River, Mass.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

MILLION Dollar future! Sell this auto product. Tremendous possibilities! Millions interested. Guaranteed! Thermo Exolene, Peoria, Ill.

SENSATIONAL Device cuts, trims own hair. Also formulas. Plaza Laboratories, 1558 North Clark, Chicago.

205 WAYS. Start own moneymaking business. Select line not overcrowded. Particulars free. Stamford, 3762-b Broadway, New York.

SELL Religious statuettes set in shrine of preserved flowers. Ideal Christmas gift. Sample 50c. Large size \$1.00. Rice, 109-50 Merrick Rd., Jamaica, N. Y.

WATCH-DOG Tax collector prevents knocking down, makes customers want to pay sales tax. Box 108, Shelby, N. C.

NEW Improved gas station "service signals." Knipp, 1915 Florida, Long Beach, California.

BIG Sparetime profits taking subscriptions—all magazines. Pines, C-583 Monroe, Brooklyn, N. Y.

LATEST Sensation, perfumed Christmas folders. New self-selling plan free, sells all types Christmas cards. Reynolds Company, 5510 LeMoyn, Chicago, Ill.

MEN In factories and industrial plants sell watches cheap. Thomson, 474 Summer Ave., Newark, N. J.

SOMETHING New Jo Bo Rubber Bow Neckties. Article of real merit. Good sideline. Jo Bo Products Co., 3402 School St., Des Moines, Iowa.

SPARKLING Tinselled Christmas signs, 11"x14", cost 5c, sell 25c. Make Christmas money. Lowy, 8A West Broadway, New York.

SELL 50 Assorted Christmas cards with name \$1. Costs 50c. Free sample offer. Other profitable sellers. Nickel's Press, 4617 Loughborough, St. Louis, Mo.

NECESSITIES Are always in demand! Experience unnecessary to earn steady income supplying tremendous demand for customized shirts factory to wearer. Gigantic variety; one year guarantee; ninety sizes. Half price offer creates amazing values. Superior advantages eliminate competition. World's largest concern of its kind. Our sales force earns \$100,000.00 yearly. Get your share! Postcard brings you complete self-selling outfit free. Simply write orders. We deliver and collect. Write Dept. 404, Roseliff-Quaker, 1239 Broadway, New York.

"CHRISTMAS Cards" Beauties. Big profits. Investigate. Hamilton, 4341-P Meade, Chicago.

MONOGRAMMING Automobiles real money maker. Write for samples. International Co., Box 9360, Philadelphia, Pa.

COLLECT Your bad debts. Merchants write Lamont Company, Beacon, New York.

HANDLE Exclusive territory for unique business service. Long profit. Real cooperation. Box 5411, Philadelphia.

SELL Artistic oil painted personal portraits! Portraiture, 2637 Evergreen, Chicago.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2819-T Dodder, St. Louis, Mo.

500% PROFIT. Gold and silver colored sign letters. Offices—stores. Large sizes, 1c. Free samples. Modernistic, B-3000 Lincoln Ave., Chicago.

CHRISTMAS Card box assortments selling like "wildfire." People who have never sold a thing in their lives are reaping harvests with our "New Champion" 21 folder assortment, including sensational "mystery card"—Biggest sales-puller of all time. Costs 50c—sell for \$1.00. Worth \$2.85. Also seven other bargain assortments, and personal imprinted cards. Write today. Samples on approval. Silver Swan Studios, 320 Fifth Ave., Dept. 74, New York.

AGENTS—Amazing new glass cleaner sells fast, repeats. Demonstrations reap big profits. Needed everywhere. Write Universal Utility, Gloversville, N. Y.

500% PROFIT! Transfer sign letters for windows, offices, trucks, signs. Colors: gold, silver, red, many combinations. Auto monograms. Easily applied. Neonite, Akron, Ohio.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, PO, St. Louis, Mo.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

SUCCEED With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

300% PROFIT Selling gold leaf letters for store windows; high grade letters 1½c each. Free samples. Metallic Co., 438-B North Clark, Chicago.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order decalcomania name plates. "Ralco," 1305 Washington, Boston, Mass.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

AGENTS—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Embroidered checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS! Men's suits \$1.53, pants 37c, dresses 15c, ladies' coats \$1.10. Other big bargains. Catalogue free. Roosevelt Mercantile, 566-AM Roosevelt Road, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

AUTO Accessory men! Excellent sideline. Old reliable sparkplug company. Unusually liberal working plan. Irresistible dealer proposition. Protected territory. Write Reflex Sparkplug Co., 10905 Madison, Cleveland, Ohio.

ADVERTISING Book matches offer daily cash profits. Experience unnecessary. Full, spare time. Call on business places. Factory direct. Low prices for high quality, quick deliveries, bring easier orders; faster repeats. Free outfit, instructions. Match Corp. of America, 3433 West 48th Pl., Dept. E-11, Chicago.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

OPENINGS! Call on all dealers with new trade-stimulator plans. It's "hot." \$3 commission on each \$5 sale. Big repeat commissions. No investment. Sales kit free. Universal, 6227 Broadway, Dept. C511, Chicago.

SELL Printing at cut prices. 2,000 business cards \$1.50; 1,000 envelopes or statements, etc. \$1.75; 25 printed sales books \$1.50; 1,000 process embossed cards \$1.50; 2,000 two-color labels, free holder \$1.50; 2,500 printed handbills \$1.75. One-third comm. Free outfit. Bargain Prtg. Co., 189-F W. Madison, Chicago.

SELL Xmas cards. 50 with name \$1. Unequalled. Also America's finest box assortment. Costs 50c. Sell \$1. Worth \$3. Sample on approval. National Greetings, Douglas Bldg., 3rd and Spring, Los Angeles, Calif.

SALESMEN: America's finest sideline. 40% comm. daily. 725 fast selling repeat items. Every business uses and must buy. No investment now or ever. Sales portfolio free. Willens, 2130 Gladys, Dept. MJ, Chicago.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 10-L, Spencer, Ind.

SELL Complete line business necessities—over 1000 items. 50% savings to every merchant. Experience unnecessary. Samples free. Commissions advanced. Northwestern, 625-RQ Jackson, Chicago.

RAWLEIGH Men make good money. Supply everyday household necessities to Rawleigh routes of 800 family users. Ambitious men can make good earnings at start. We furnish everything but the car. Write today. Rawleigh's, Dept. K-A-PPM, Freeport, Ill.

DRESSES 10c. Hats 40c. Shoes 50c. Many other bargains—used merchandise. Free catalogue. Send name on postcard. Fairmount, 162PM Monroe Street, New York.

CALENDARS—Beautiful complete line, all sizes, including jumbos. Samples free. Also Christmas cards. Fleming Calendar Company, 6539 Cottage Grove, Chicago.

SALESMAN, Distributors: 200 items, brushes, mops, marvelous magnetic brush—excellent vacuum cleaner. Big profits. Neway Brush Co., Hartford, Conn.

SALESMEN Sell harvest hats. Big commission. American Harvest Hat Company, St. Louis, Missouri.

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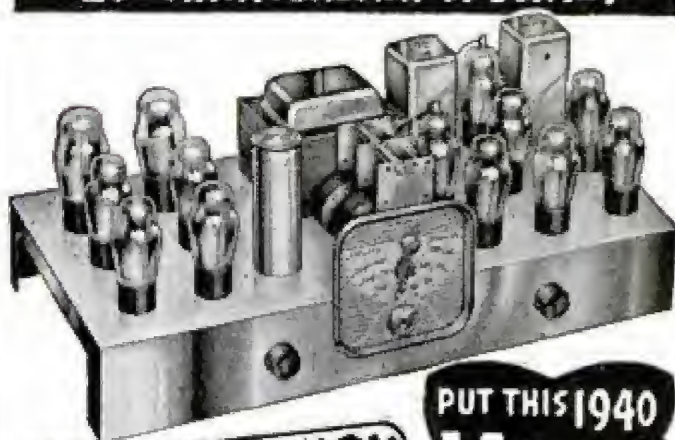
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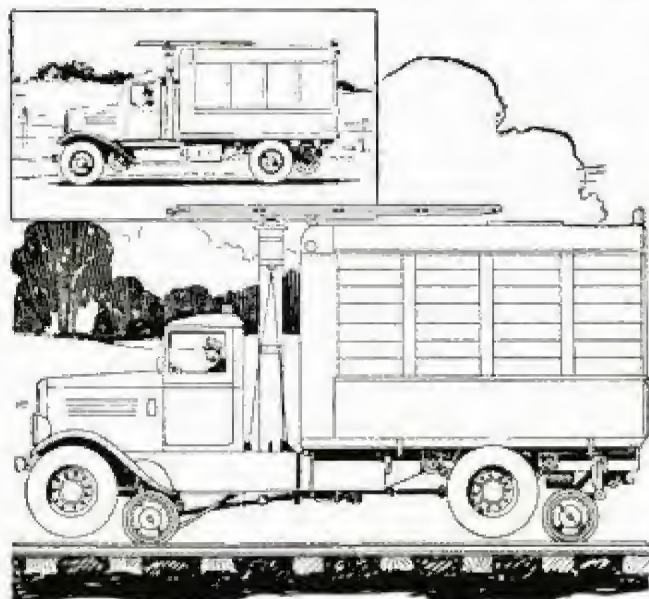
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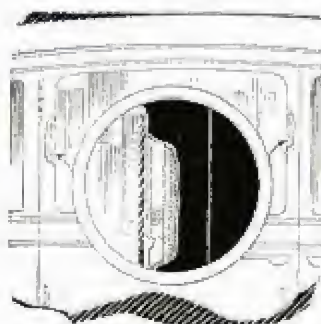
(Continued from page 34A)

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(Continued to page 58A)



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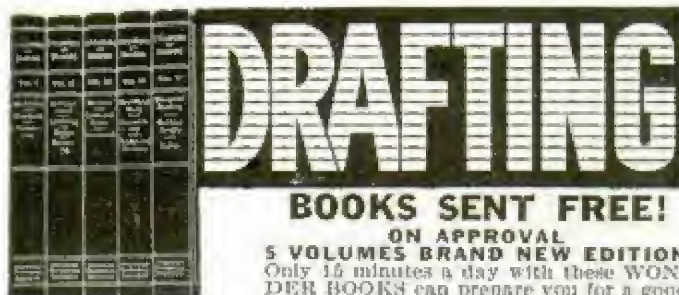
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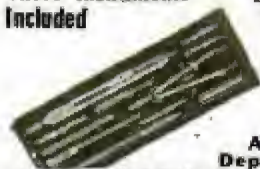
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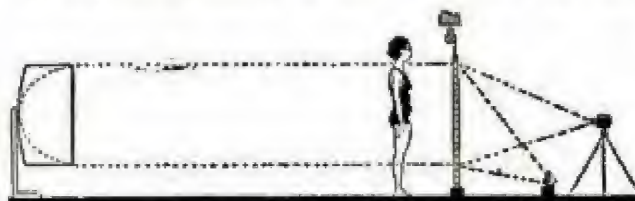
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POPULAR INVENTIONS

(Continued from page 55A)

INTENDED as a means of fitting clothes accurately without the laborious measuring now necessary, a new system has been patented. It compares a person to be fitted with a garment to a standard pattern by superimposing a true outline of the



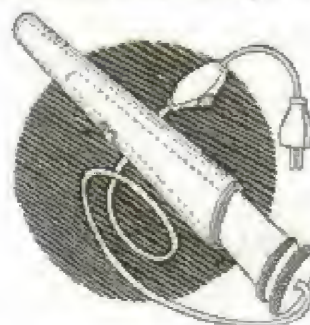
person by projecting light rays on a screen upon which is the standard pattern. With the person standing between the light source and the translucent screen, another light beam illuminates both the person's outline and the standard pattern.

DESIGNED to give any worker greater stability on a ladder, a step attachment for ladders has been patented.



The step is suspended from two hanger supports constructed to hook over a rung. Its outside edge rests on the legs at each side.

FOR renovating neckties, a newly patented device operates by electricity. It consists of a flat surface and an opposed rounded surface joined together in a shape that fits neatly into the tie. The form has water-absorbent means for holding water in suspension and an electrical heating element for producing steam.



Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.



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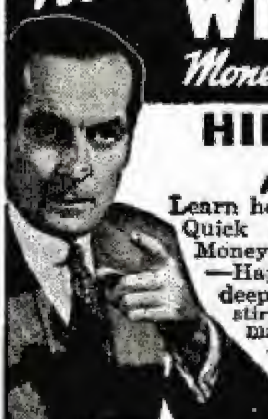
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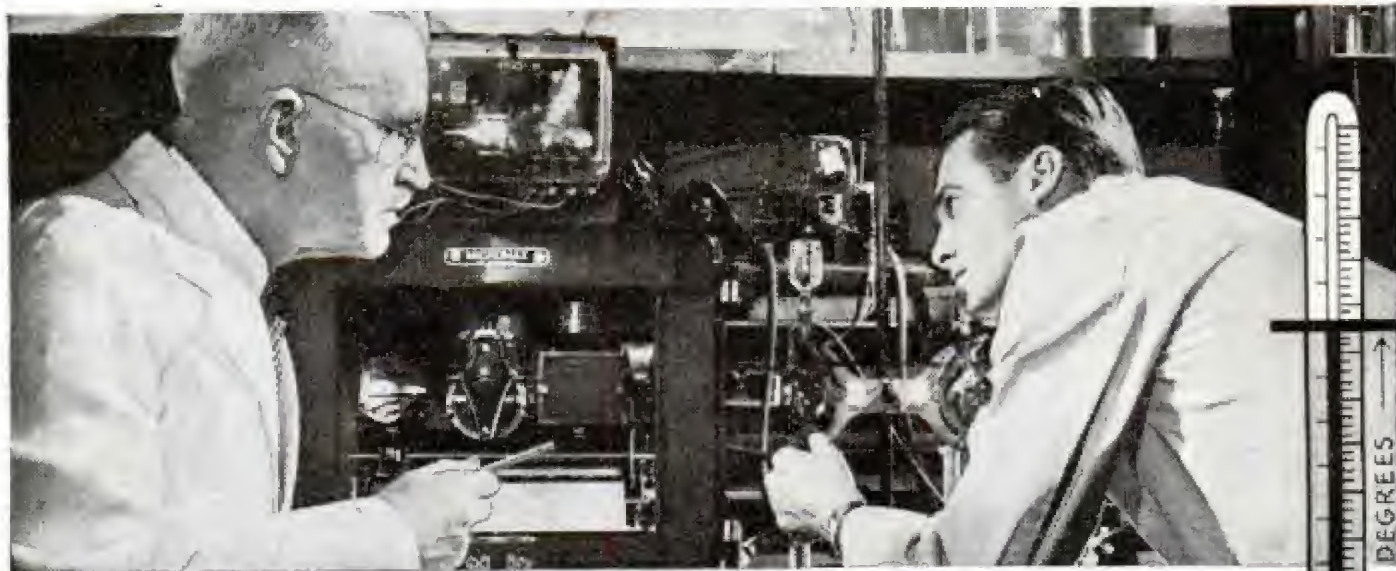
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Vol. 72

NOVEMBER, 1939

No. 5

NO ²⁹³⁶ "BLIND" DRIVING IN 1940 CARS



Studebaker's "Champion," the LaSalle and the Chrysler, all with sealed beam lights

By Julian Leggett

FOR the first time in automotive history, the industry is making a concerted effort to eliminate "blind" driving from America's streets and highways, so we find the 1940 cars designed for greater efficiency of seeing. A new head-light system is introduced for greater safety from dusk to dawn; improved glass in windshields and windows offers greater visibility in both night and day operations. Other outstanding developments and trends include: Low-slung





Left, four-door Willys sedan. Right, shifting levers on 1940 Cadillac and LaSalle are lengthened as aid to operating ease. The levers lead directly into transmission



Above, strip showing how the new Buick jack and supporting unit are used in removing wheel. Right, Pontiac's DeLuxe Eight four-door sedan on 120-inch wheelbase. It is powered by 100-horsepower L-head engine



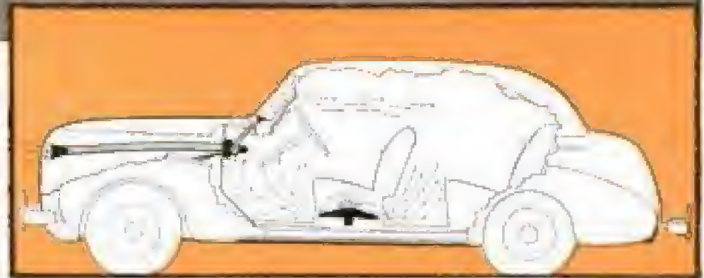
Left, seats in cars with Fisher bodies have foam rubber and cotton pads superimposed on spring base. Below, LaSalle "Special," with "torpedo" body. Note projectile-like appearance. The car has no running boards, due to being built low. It has an unusually wide front seat



2936



Above, Hudson's Country Club sedan. Running boards are optional. Right, sketch of Buick's air intake and under-seat heating system. Below, Chrysler "Royal," illustrating ease with which modern car transports six passengers



Circle, how Buick's antenna can be swung upward for improved reception by means of control inside car. Bottom, Cadillac "60 Special" for 1940 has more modish hood and front-end ensemble



torpedo-shaped bodies that introduce a new conception of interior spaciousness; better heaters which control air temperatures and circulation within the car; longer wheelbases, achieved in most cases without increasing over-all length, and softer springing to make the ride more comfortable; a general movement to eliminate running boards and a hint that rear fenders may soon vanish into the body lines; exterior color schemes which permit such combinations as blue body and gray top; increased use of plastics, of which one manufacturer takes full advantage by turning out white instru-



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Top, Country Beam of new-type headlamps. Below, Traffic Beam. Note how approaching driver is guarded against glare. Top, right, sketch of headlamp, parking lamp and manner of mounting in fender



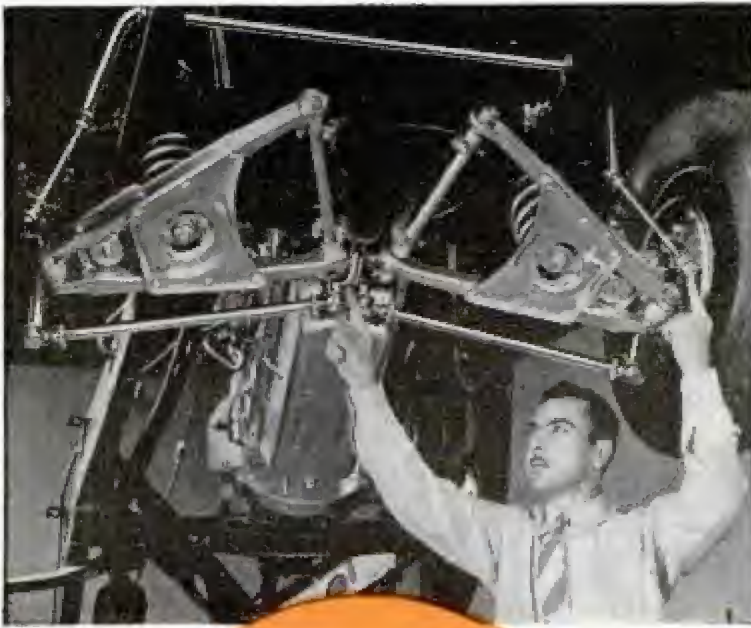
ment panel, steering wheel and interior trim; and extension of the use of directional signals, operated by steering-column lever.

The new headlamps, product of three years' cooperative work by auto and headlamp makers, collaborating with public authorities, are employed generally on the new models. Providing about fifty per cent more illumination than did previous headlights, the system is a valuable contribution to safety because inability of drivers to see clearly is held largely responsible for the fact that two-thirds of all fatal traffic accidents occur at night. The distinguishing feature is that the lamp is made as a permanently sealed unit, consisting of either metal or glass reflector, light source and lens, with each element adjusted to a fine



Inset (center), how lamp unit fits into housing. Bottom, left, sketch of illumination given by Traffic Beam (top) and Country Beam (below). Right, checking intensity of various parts of beam pattern with special meter at Nela Park laboratory of General Electric

2936



degree of precision at the factory. Dirt, dust and moisture cannot enter the unit, assuring freedom from filming, corroding and fogging and resulting in high efficiency throughout the life of the unit. All makes of the new lamp will fit any car equipped with the system. The owner will replace the entire unit when the bulb burns out, but the apparent increased cost is offset by using bulbs with longer-lived filaments.

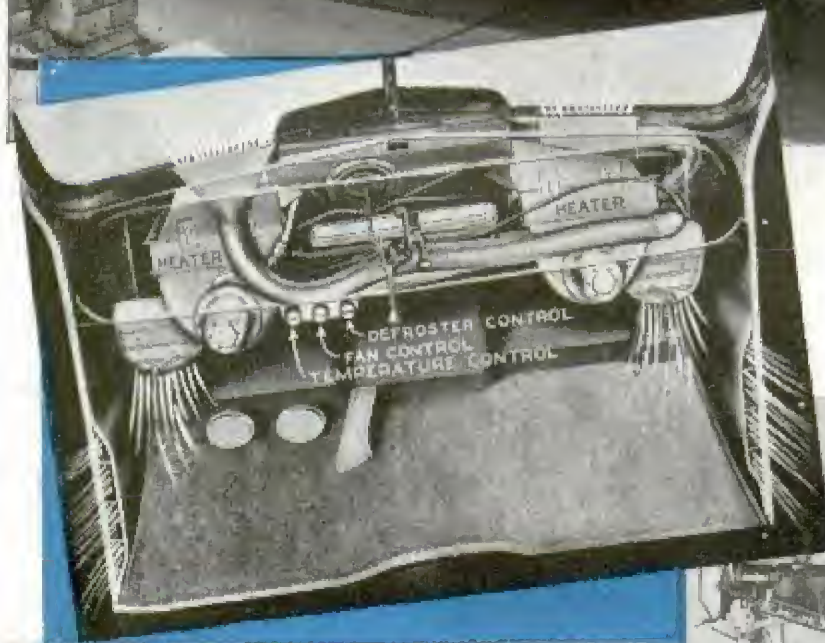
Two beams are provided by the system. The first, a no-glare beam for use wherever there is movement of vehicles, is the Traffic Beam. The second, for use when the road is clear of traffic, is the Country Beam. Throwing its light a considerably greater distance than did former types, it bathes road shoulders, warning signs and

curves in light. You switch from one to the other beam with the familiar floor button and your instrument-panel switch has only two positions, one for parking and signal lights, the other for headlights.

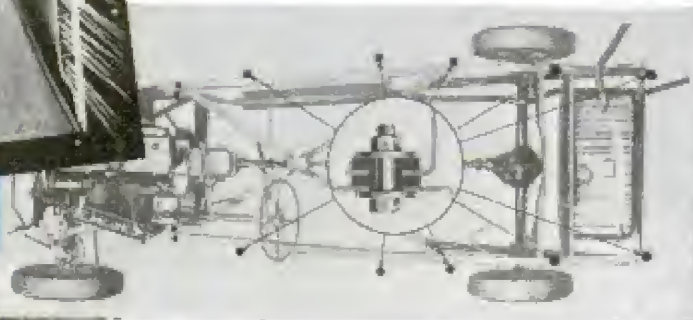
Enlarging the driver's range of vision and eliminating distortion of images are accomplished by increasing glass area in windshield and windows, by cutting down pillar sections supporting the windshield, by replacing, in some cases, the divided rear window with a large, single piece of glass, and by using glass with greatly improved optical properties. General Motors cars using Fisher bodies have a high-test laminated safety plate glass which relieves eyestrain and affords greater accuracy of vision. Chrysler and other manufacturers offer glass



Top, engineer indicating Hudson Center-Point steering with right hand, and Auto-Poise Control connections to front wheel. Below, Buick with "torpedo" body. Right, Chrysler's white plastic instrument panel. Bottom, "One-Ten" Packard touring sedan which retains the distinctive Packard lines



Above, the new Plymouth, which features eye-appeal and a more comfortable ride. Left, Chrysler Corporation's air-control system, with vents at side. Below, new type mountings between chassis and body reduce road noise in Pontiac. Bottom, Nash's four-door LaFayette on 117-inch wheelbase



that is safer and tougher, as well as better optically.

The "torpedo" body, developed by Fisher Body for various divisions of General Motors, is smoothly streamlined, has no running boards, boasts an unusually wide front seat, and is equipped with such innovations as concealed door hinges, outside door locks on both front doors, new inside door locks,



new door lock covers, upholstered folding center armrest in rear seat of sedan and chromium moldings on windshield, side and rear windows. Rear fenders approach the point of disappearing into the body. In the Pontiac, the "Torpedo Eight" has a two-inch longer wheelbase than the next car in the line, the floor is one inch lower, the over-all length is seven and one-half inches greater and windshield and rear window have larger glass area. The front seat is five inches wider, giving a space sixty inches wide for three passengers, plus

(Continued to page 142A)



Top, left, Pontiac's lowest-price car, the Special Six. Right, front-end view of new Plymouth. Below, cut-away of Plymouth's engine showing details of mechanism



Circle (center), front end of the new Buick denotes strength. Bottom, left, nose of the Hudson touring sedan. Running boards are optional at no extra cost. Center, detail of Packard's front end. Right, grace of modern streamlining is exemplified in this view of Cadillac

2 818 Cont James M. Sweeney
421 W. 60th Terrace,
Kansas City, Mo.

The BAND



YEAR by year the band's gyrations in forming living flags, letters and intricate designs have grown more and more scientific. Today the crowd gets such a thrill from its displays that the teams must execute unusually spectacular plays to hold their place in the spotlight.

If you're lucky enough to get into the University of Illinois stadium on "Dad's Day," you'll see 350 musicians—Illini's entire musical strength, the concert group, and the first and second regimental bands rolled into one. On other occasions, a 175-piece football band holds forth.

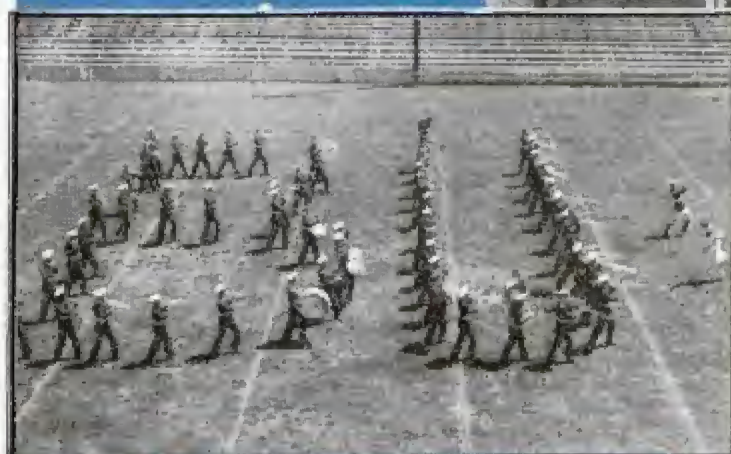
When college bands first started entertaining football crowds, their efforts were confined to forming initials. Contrast these with some of Illini's best-remembered formations of the last few years—a cannon

from which "shells" were fired to form the word Army; the Army mule, and the word Ohio, which changed into Auto with the "O's" as wheels so it could roll down the gridiron; a stalk of corn that "grew" on the fifty-yard line in honor of the University of Iowa; a butterfly for the playing of an excerpt from "Madame Butterfly"; a flag with a "C" inside it, which waved as the band played "Wave the Flag for Old Chicago"; Notre Dame's "Irish Eyes"; an out-

Top, left, photo taken at 1/1000th second shows how drum major twirls baton at high speed. Right, band's marching plan for formation of star, with each man's position shown. Below, Michigan's band forms the star

8/8 Ellis Carroll, Director
Butler Band.

STEALS *the* SHOW

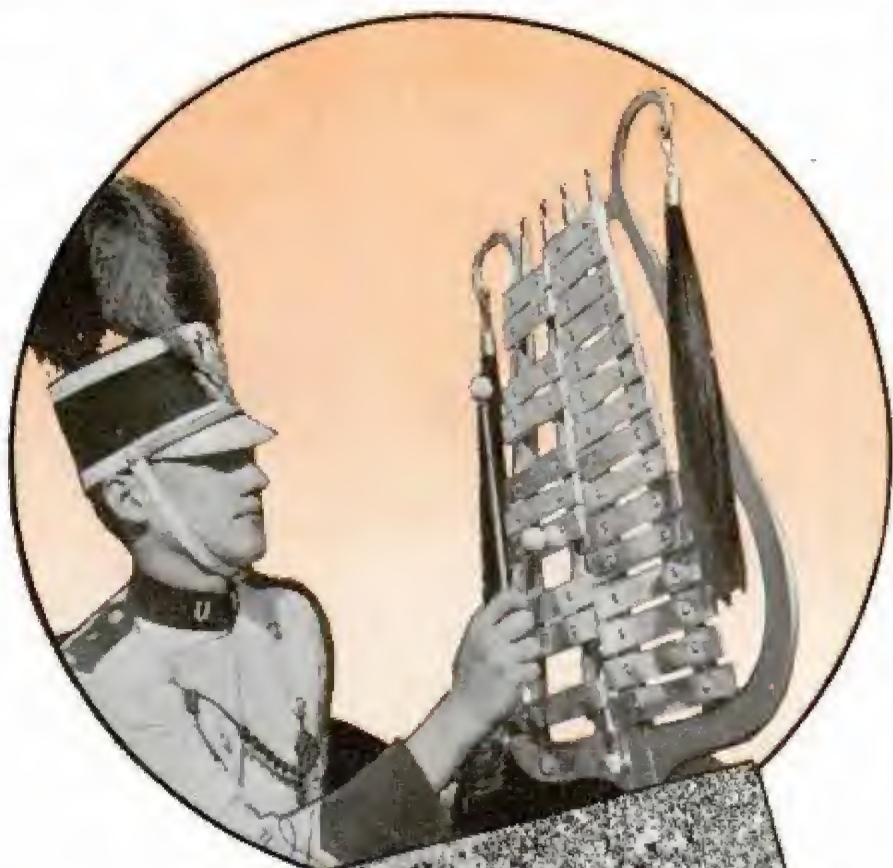


line of the state of Ohio with the Ohio river "flowing" to the music of "Beautiful Ohio," and a clock with a second hand that moved around, the time being told accurately.

For one of last year's appearances, Mark H. Hindsley, assistant director, worked out a formation in which the band proceeded to spell out "Music." A radio dial appeared



Top, diagramming formation while band's board of strategy looks on. Center, Butler band in E. U. formation marches down field. Bottom, Cornhusker band ready for the starting whistle



Top, glockenspiel is part of Nebraska band. Center, first word of tribute to alma mater. Bottom, moving letter as executed by Michigan band



Michigan's idea. The Wolverines has long been known for its striking field mosaics—stars, horseshoes, covered wagons, windmills, clocks, and bicycles. Purdue's band started the letter formations and Indiana's famed military band perfected lightning switches from one word to another.

While playing host to Notre Dame, the Illini band once played "St. Patrick's Day" while spelling out Irish. Before concluding the piece, the middle "I" grew into a question mark, as if to inquire if the Irish of Notre Dame were all Irish! An entertainment highlight of the southern football circuit is the original fifty-piece swing band of Texas Christian. The ability of the Horned Frogs to jam and jive have won them a national

in the center of the "S"—a large bass drum surrounded by smaller drums with a chrome baton as a pointer. As the dial moved around, excerpts from Wagner, Beethoven, Schubert, Liszt, and others were heard.

These formations are carried out without a single whistle or gunshot signal from the director, all marching cues being taken from the musical passages.

Staging an entire performance without the band coming to a halt or any of its members missing a note of music was

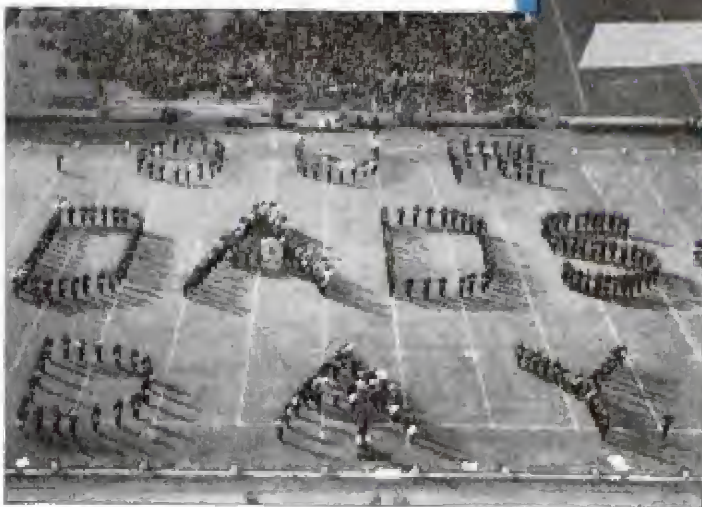
following. Their brand of swing, explains Don Gillis, the director, is written out note for note just as the conservative marches are. A swing arrangement seldom lasts more than three weeks so a corps of arrangers is kept busy turning out scores.

During the spring and summer months when the football coach is out rounding up grist for the football mills, the band director is giving auditions to musical hopefuls. Membership in Indiana's band is limited to ten seniors, twenty juniors, forty sophomores, and sixty freshmen, so Director

Frederick E. Green's task is largely one of selection.

The University of Nebraska, in addition to the 110-piece varsity band, maintains a large freshman band. Ordinarily, a player must spend a year on the freshman band before getting into the varsity. One joint display by the two bands is a colorful shield, outlined by the varsity musicians in brilliant scarlet and cream uniforms with the blue-and-white clad freshman players representing the stars and blue field.

Approximately 225 students report for band duty each year at University of Oklahoma. Once a player is admitted into the band, he must spend five to seven hours a week drilling and two to four hours more improving his music. On top of that there may be a few hours of private practice as many bands insist the players memorize their music so they can give their whole attention to singing and marching when they're on parade.



Top, cornetists hit a high note. Center, planning maneuvers with toy soldiers and scale model field. Bottom, Illini's band pays a tribute to Dad's Day

A marcher who is given to day-dreaming or has difficulty remembering his right from his left hand can wreak havoc with a display. Fifty thousand pairs of eyes are focused on the pageant. The players must have correct posture, carriage, and bearing. Tiptop physical condition is required to endure the rigors of continuous marching at a cadence varying from 150 to 210 steps per minute while playing for periods as long as thirteen minutes.

Ellis Carroll, director of the Butler Uni-

(Continued to page 141A)

And Michigan

Movie Camera on Gunstock Is Aimed Quickly



Taking steady aim with movie camera attached to gunstock for taking pictures from small boats

After trying with little success to take motion pictures of leaping fish from small fishing boats, whose unsteadiness eliminates use of a tripod, one photographer solved the problem by mounting his camera on a gunstock. When a fighting fish is hooked he can now get a steady aim for the picture, allowing his sea legs to take up the pitch and roll of the boat. The gunstock was specially made to fit the camera.

Gasoline Runabout for Shopping Has Plywood Body

Easy to handle in traffic, a small runabout, built for convenience in shopping, has a body of wood and plywood with glued joints to prevent squeaks and rattles. Storage space is provided in the rear cockpit which can be converted into a rumble seat. A small Willys engine drives the



Midget runabout with plywood body has space in back for luggage or extra seats and is easy to handle

lightweight car. All the accessories are inside the body to give a clean appearance, the gas tank being concealed and a small door in the rear giving access to the tank cap. Even the lamps are inclosed in the front grill. The hood opens from the front. The chassis is a 1933 model Willys automobile. Two openings on the side are ventilators, one for the driver's cockpit and the other for the engine.

Giant Sign Is Shot into the Air and Unfolded by Bomb

Giant-sized signs used in a new advertising stunt are shot 350 feet into the air by a mortar and unfolded by explosion of an aerial bomb. Weighing less than nine ounces, the signs are imprinted with im-



Lightweight sign in form of tire it advertises was shot into air by mortar and unfolded by aerial bomb

ages about fifteen feet high. The signs float in the air from two to ten minutes depending on the strength and direction of air currents. The aerial signboards are used at bathing beaches and other public places.

Built by Quentin Berg, 20 1/2, North Canton, Ohio

newly all 3rd av. 409. Aerial Advertising Co. comes

Blind Spots in Eyes Are Charted by Vision Test



Blind spot in eye found by looking at black circle in chart and moving it slowly back and forth until cross disappears. Optical instrument, left background, examines field of vision

Did you know you have a blind spot in each eye? Here is how you can prove it. Close your left eye, look at the black circle on the chart in the illustration, and bring it slowly toward you. At a certain point the cross at the right will disappear. Repeat the same process with the right eye closed, and the left cross will disappear. These blind spots are points in the retina where the optic nerve connects with the eyeball. Everybody has them. If they become enlarged or distorted in size, or if other blind spots show up, some diseased condition is indicated. For exact measurement of blind spots a testing device has been developed which permits thorough examination of the visual field. The patient looks through lenses at a chart, one eye at a time, and then objects are placed within his field of vision on the chart and a diagram is prepared outlining the exact area he can see.

Five Ride on Three Bicycles Linked Together

Hook two bicycles side by side with a tandem at the rear and you have a bike built for five. At the seaside resort of Ostia, Italy, four of the girls riding the vehicle provide motive power, while the fifth, in the pilot seat, merely does the steering.



Four pedal and one steers bicycle built for five

Streamliner Driven by Engine in Each Car



Sketch shows front and rear end designs of proposed train. Inset, driver at the controls of an earlier type car. Streamlining will be employed to the greatest degree recognized as practicable

Powered by a horizontally mounted gasoline or oil-burning engine in each car, the latest streamliner will offer speed and unusual flexibility on even secondary runs. The power necessary under any condition may be used. The engine will be installed beneath the floor of the car and its power transmitted through a geared transmission or a hydraulic torque converter operated by remote-control devices. An advantage of the engine-under-floor car is that the entire floor area may be utilized for rev-

enue. Another advantage is that passenger requirements may be fulfilled more accurately simply by adding one or more cars, each with its own engine, to the train as the passenger list increases. The front of the train is smoothly rounded, to reduce wind resistance, the lines being broken only by the "cowcatcher." Painted in striking colors, an articulated train of this type will present a pleasing appearance. It is designed by the American Car and Foundry company.

Torpedoes Are Launched in Pairs from Forward Tubes



Two torpedoes are launched simultaneously by motor torpedo boat of British navy during demonstration in English channel

Two torpedoes are launched simultaneously by Britain's latest type motor torpedo boat. Very fast, she carries two torpedo tubes, one on each side and pointing directly ahead, which let go their destructive agents when the ship has been maneuvered at full speed into the desired position.

A tube of pure nickel has been drawn with an outside diameter of .0026 inch, the width of a human hair, and an inside diameter of .0007 inch.

American Car and Foundry Co.
30 Church St. New York

Engineer J. J. ...
1226 Oak St.
Lawrence, Mass.

2968

Aug. 19, 1939

Business Week

Superior Tube Co.
Norristown, Pa.

Rotary Camera Takes Pictures on Disk Film



Above, using enlarging machine. Circle, focusing the camera. Right, removing disk film

Regarded by the inventor as offering the possibility of altering the future of photography, a rotary camera that takes twenty-four exposures on a circular film is being prepared for the market. From the negative film, enlargements up to eight-by-ten inches can be made with a rotary enlarger which also will be available. The camera is provided with time-exposure lever, snapshot lever, apertures adjustable for different sizes and a dial that controls movement of the film. Various grades of film will be supplied for all types of snapshot or time photography. The inventor claims that the disk film is much simpler to handle than ribbon or strip film. The enlarging machine plugs into any 110-volt, a.c. socket. A negative disk film is placed on a center spindle and the enlarger adjusted to the size desired. Simplicity of operation of the camera and enlarging machine is claimed by the inventor.



Air-Conditioner Filter Guard

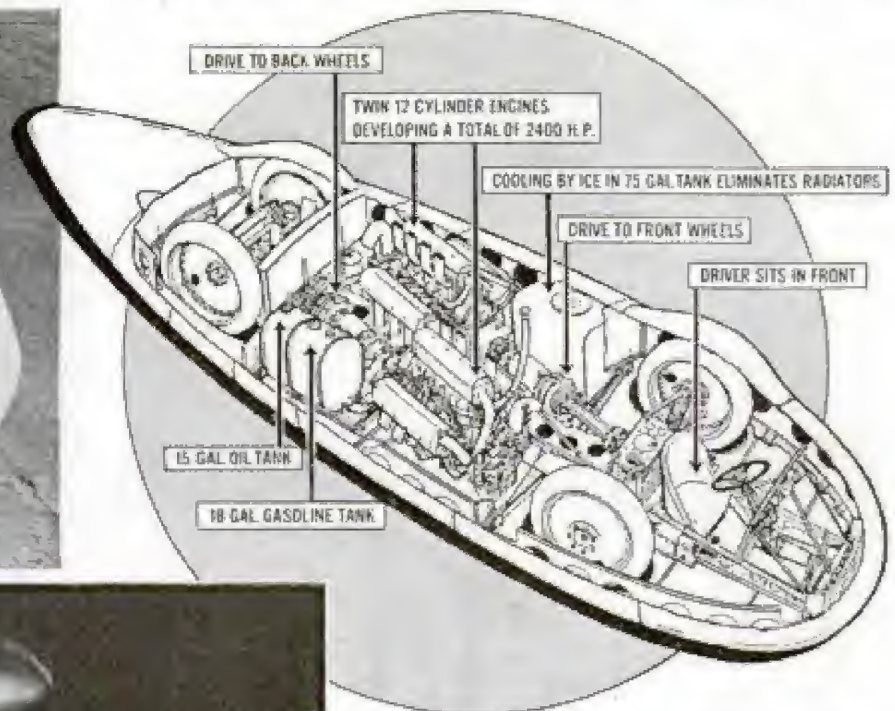
Immediate warning is given by a telltale light when it is time to change or clean the



home air-conditioning filter. The filter guard is attached between the blower and filters. As soon as accumulated dust causes excess pressure to build up in the duct, the signal lamp flashes.

Simplex Controls Corp. 706

Beetle-Back Car Is Fastest Thing on Wheels



Above, left, streamline racer in which Cobb broke speed record is pictured from rear on Salt Bed course, and diagram, right, shows location of engines and other inner works of racer. Below, mechanics make final adjustments; body is in background

In colonial days men riding in ox-drawn wagons traveled at speeds of three or four miles per hour. Today, at least one man has traveled on land faster than six miles per minute. He is John B. Cobb, of London, who brought his racer, the "Railton Red Lion," to the Bonneville Salt Beds in Utah to establish new world's records. The course is ten miles long, with a run of about a mile and a half before entering the ten-mile stretch. Starting northward Cobb drove through the measured mile where time traps were set at 370.75 miles an hour—the fastest ever traveled by man—and then came back at 366.97 miles an hour. Officially, his average speed for the mile is computed at 368.85. In this same run a new record for the kilometer (five-eighths of a mile) was fixed at 369.74. Previous marks were held by Capt. George E. T. Eyston

who pushed his "Thunderbolt" to 357.5 miles per hour. Three other international speed records on the straightaway were smashed in later attempts by Cobb, for five kilometers, ten kilometers and for ten miles. Cobb's automobile is unique in its lack of a tail, which was considered unnecessary for a straight track. The \$100,000 speeder has two twelve-cylinder Napier Lion engines set off center between the front and rear wheels, the rear engine driving the front wheels, and the front engine driving the rear wheels, totaling more than 2,400 horsepower to move the three and one-half ton creation. The sleek body is regarded as the last word in streamlining. It has no radiator, ice in a seventy-five gallon tank being used to cool the engines.

Because many bridges as now built need all but one-sixth of their strength to support their own weight, Prof. J. B. Wilbur of Massachusetts Institute of Technology predicts future bridges will be built of aluminum,

Cambridge, Mass
Compressed Air
Jul 1934

Designed by Reid
Railton, Built by J. Taylor

Analysed
Laboratory of Mechanical

SHOOTING *from the* CLOUDS

657



Sighting his heavy aerial camera through the open window of an American Airlines flagship, Merle J. Oelke, the author, uses a lapel microphone and radio headset to direct his own pilot and that of the sky liner he is "shooting."



2630

Cameraman catches impressive view from runway, above, as a big one wheels over airport. Left, sunrise "on top," framed by window of Memphis-Fort Worth ship—a scene any passenger can film.

work of an air-line photographer.

Sometimes I wonder why I chose this profession. And then I remember a sunset above the clouds, a race to bring back air pictures of a train wreck, thrilling rides above Niagara Falls and Boulder Dam. I remember darkroom thrills as spectacular views of a city from the air sprang into life on film.

And there are the "interesting people you meet."

Usually things happen so fast in the sky that adventures are over before you know they're adventures. On one job out west we were so close to an unhappy landing that I get limp thinking about it, but at the time I was so preoccupied with the camera it didn't occur to me to be frightened. We had been sent to join a fleet of ships hunting for a missing plane in the neighborhood of Mt. Frazier, south of Bakersfield, Calif. Our mission

658
By MERLE J. OELKE
American Airlines Cameraman

CLUTCHING a thirteen-pound camera with both hands while you look through the open door of a plane bouncing in the up-drafts of a forest fire, playing hide-and-seek with the navy in a land plane drilling holes in the clouds thirty miles from shore, snapshooting a shy celebrity who calmly takes the camera away from you and ruins your film—it's all in the day's



2630

was to photograph the ground in the hope that the plane, hidden from the eye, might show up on an enlarged picture. Well, before climbing up high to photograph, we thought we'd take a look with our own eyes along the slopes of Mt. Frazier. We were skirting the leeward side of the mountain when I became conscious that we were losing altitude. Down, down we munched until it seemed as if the trees were about to poke through the bottom of the plane. We were in the treacherous downdraft you always get in the lee of a mountain. Just about the moment I realized the helplessness of the pilot, he managed to ease out of that current and headed upstairs.

Since then, when someone wants an aerial shot of a mountain, I've always insisted on shooting from the

malibar

650

Forest fire sweeps a California mountain, above. To get this picture the photographer had to maneuver to windward and stay high enough to avoid dangerous bumpy updrafts. Below, one sky transport snapped from another over Los Angeles.





660

Natural-color photo reveals murky waters of Chicago river meeting clear water flowing in from Lake Michigan. In background is Chicago's Merchandise Mart.

windward side. However, you can't always choose. Editors are very exacting. If it's a forest fire, they want the picture to show the smoke, the flames, the burned-over area, the threatened section, and any towns or people or roads in the path of the blaze. As for me, I want to point the camera away from the sun, I want to be on the windward side away from the smoke, and I want to be high enough to stay out of the bumpy air over the fire.

Once I filmed a forest and brush fire in California from a height of only 500 feet. The blaze was in a canyon less than a mile from the airport. We had seen the plume of smoke start up, and when the call came to get pictures we lifted the door off the plane and took off within a couple of minutes, headed directly for the fire. In less than a minute we were right over it. We could see men scrambling frantically up the canyon slopes, trying to reach safety at the

ridge. We bumped crazily in the hot-air blast rising from the flames. But down below thirty-five men were trapped in the encircling flames, and there was nothing we could do to save them.

You might think it a perfectly simple thing to poke a camera out the window of an airplane and snap a good picture. That's what I thought a few years ago, the first time I took a box Brownie 10,000 feet over San Diego, stuck it through the door opening and started pushing the lever that made the shutter click. Well, to begin, I pushed it too often—eight times for the roll of six, so a couple of them were double exposures. One was nothing but a blur, but I blamed the pilot for flying too fast. Another looked as though I had focused on the sun. The others showed part of the floor, wing struts and landing gear and hazy lines that I claimed were city streets. There were some beautiful clouds in the sky, but I can't prove it by my pictures.



661

Q 630

Even from the air the scene above is familiar, the New York world's fair dominated by Tylon and Perisphere. Below is the metropolis of southern California. It takes close coordination between pilots to pose the big sleeper plane against the desired background.

Los Angeles





Oelke points his mosaic mapping camera out the side of the small cabin plane, left, which he likes for its maneuverability when vertical or steep angle shots are wanted. Below is one of his "news" pictures, a view of a railroad wreck taken "on the run" from low-flying plane and then rushed to newspapers.

662 9630
Live and learn. By years of trial and error I've picked up a few ideas about what to do and what not to do with a camera in the sky. In the first place, pick the right camera; for scenic photography from the air, I prefer a four-by-five camera with a good-quality lens of ten-inch focal length. With a lens of that length you've got to sight it like a rifle and hold it steady; if you thrust it outside the door or window the air blast will either rip it from your hands or blur the image badly. Nor can you rest it on the floor or window ledge; vibration would show up on the negative.

All this doesn't mean that you can't get a picture when you ride as a passenger in an air liner. You can, if you watch your moments. Shoot through the window at the sunlit clouds. Aim steeply downward at the patchwork





Top, air view of throng attending Easter service at Forest Lawn, Los Angeles; notice cars on serpentine road. Bottom, Oelke talks into microphone as he focuses on plane below.

of fields, the slanting skyscrapers, the winding rivers. Watch for a chance to focus on the ground when the pilot is banking sharply, or while taking off or landing. Look out for reflections from the glass window. Shoot fast. Close to the ground you'll need shutter speeds of $\frac{1}{250}$ to $\frac{1}{500}$ second. Higher up, I shoot black and white pictures on the average at $\frac{1}{200}$ second at $f.8$, Kodachrome usually at $\frac{1}{400}$ second at $f.4.5$. But of course there can be no hard and fast rule; it depends on weather and speed and object and distance. To cut through haze I suggest a light yellow filter, which also produces beautiful cloud effects.

Ralph Hall is my favorite pilot when I'm after a news picture. He knows exactly how to stand the plane on its wing tip to get the wing out of the way of the lens. But when I go up with Hall I know I'm in for a ride. We usually take a high-powered Northrop cabin plane, and he





664 2630
 Natural-color film brings out full beauty of Niagara's Horseshoe Falls. The liner had to lower its landing gear to slow down to pace of smaller plane carrying cameraman.

takes delight in going into a vertical bank that stands me on my head, perfectly helpless, with a thirteen-pound camera in my hands, centrifugal force increasing the weight about three times.

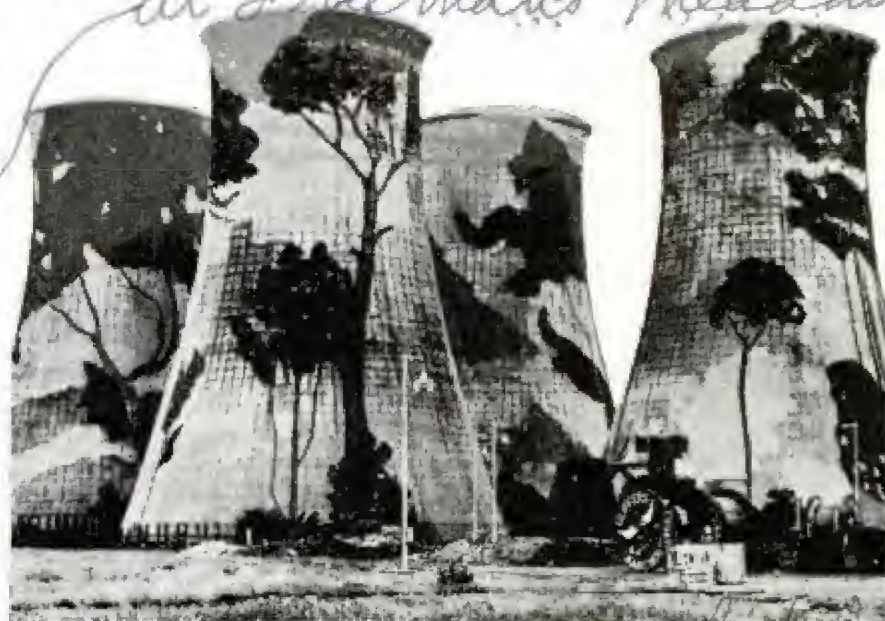
Photographing American Airlines flagships from another plane is a job calling for coordination. It takes a bit of maneuvering to get above and just ahead of the flagship and then to shoot at the right moment to take in a scenic background. I'll sit or lie in the open door of my air liner, sending messages up to the pilot by an assistant and trying to get the idea across to the other ship by waving my arms. Once the cooperation got entirely too good for comfort. I beckoned the other pilot to come closer and closer until I thought he was going to stick his wing right in my face and I waved frantically to pull away. Just the other day I went up in a Waco above Niagara Falls, where a flagship was to "sit" for its picture. Here was a nice

problem. The little Waco couldn't step faster than around two miles a minute. The Douglas liner was used to three miles a minute and more. We had to jockey around in the air above the gorge until I could sight the big ship right against the falls. Finally the Douglas solved it by throttling down to the lowest possible speed and then lowering its landing gear, which slowed it to 125 miles an hour. Meanwhile, several spectators called the airport to report a big plane flying over the falls with its landing gear down. And another time when I was circling above the Ford plant at Dearborn, Mich., waiting for a cloud to pass, the airport was bombarded with telephone calls about an "aviator lost over here. He just flies in circles."

Nowadays when I'm called upon to photograph another plane in the air I use a three-way radio instead of the hand signals. While I sight the camera,
 (Continued to page 128A)

Camouflage Used on Tanks and Big Towers

War tanks used in Europe are being camouflaged to escape the eyes of air raiders. Camouflage is also being employed to hide important factories, munitions plants and powerhouses. The huge cooling towers of the electric generating works near Leicester, England, now closely resemble a clump of trees when viewed from a distance.



Boat Preservative Lasts Longer

A boat bottom preservative that will not dissolve in water, recently announced, was made possible by the discovery of new organic chemical compounds. When these were dissolved in suitable solvents, the product proved insoluble in both salt and fresh water, non-volatile, and incapable of leaching out or evaporating. Being in solution rather than in suspension, the toxic elements penetrate the wood itself giving lasting protection.



Two examples of camouflage in Europe. Top, cooling towers painted to resemble trees. Below, tank painted to blend with surroundings

Diesel-Powered Sightseeing Boat Offers Good Visibility

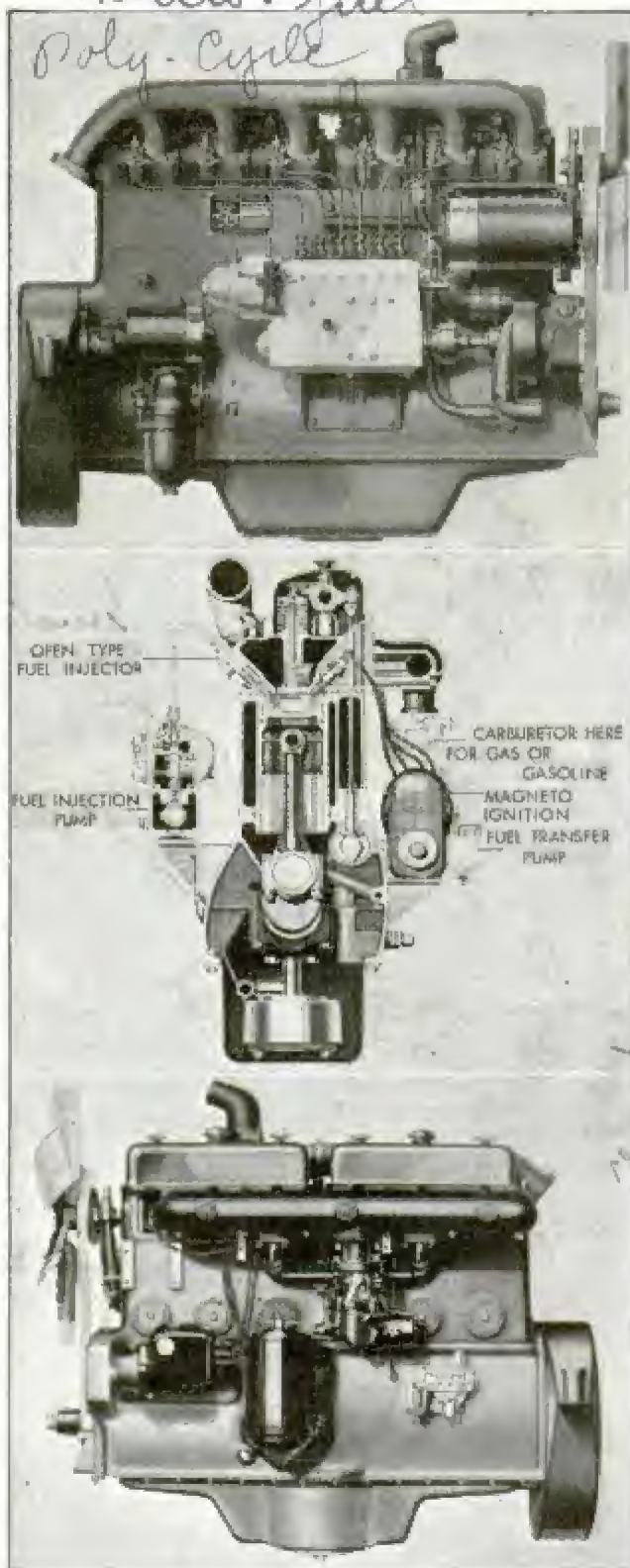


Sightseeing boat with open sides assures all-around vision for tourists

Tourists cruising on the sightseeing boat that operates on the lake at Norris Dam, Tenn., have an unobstructed view of scenery throughout the ride. Full visibility is also provided for the pilot who steers the Diesel powered ship from a glass inclosed cabin. Built low on a wide keel the sturdy vessel resists tilting and offers a safe ride to passengers on a sightseeing trip.

Bulldy. Howard Ship
Yards and Dock Co.

Engine Adapted to Any Fuel in Few Minutes



Engine fitted for oil (top) and for gasoline (bottom).
Center, cross-section view

Gasoline, Diesel oil, butane and natural or artificial gas may be used in a multi-fuel engine that may be adapted to the various fuels in about twenty minutes. Change in fuel involves no modification of internal

parts, only the fuel system being altered. As an oil engine, it operates on the Hesselman principle, with fuel injection and spark ignition. The change to gasoline is made by closing the injector openings with plugs and fitting a carburetor in place of the air horn. The engine can be adapted to burn butane, natural gas or artificial gas by equipping it with a mixer in place of the carburetor. The engine, which is the valve-in-head type, weighs only a few pounds more, as an oil-burner, than as a gas or gasoline engine. The power plant, designed by Waukesha, is said to offer great possibilities for the fleet owner permitting a test of oil-burning vehicles without limiting the operation to territory where proper oil may be obtained easily. On long-distance jobs, the multi-fuel engine permits the vehicle to operate where any one of the fuels may be found.

"Spider" Plow Fights Forest Fire by Making Wide Trench

To speed part of the work of fighting forest fires, the U. S. department of agriculture forest service is using a spiderlike "plow" to cut lanes around burning areas. One operator with this machine can do the work of several men with shovels, throwing aside all vegetation, sticks and other inflammable material to form a fire break two and one-half feet wide. A five-horsepower outboard motor rotates the digger.

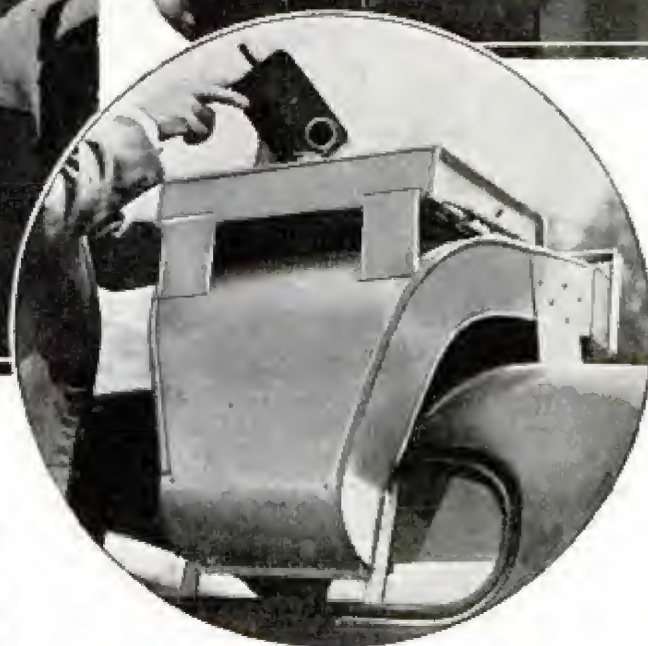
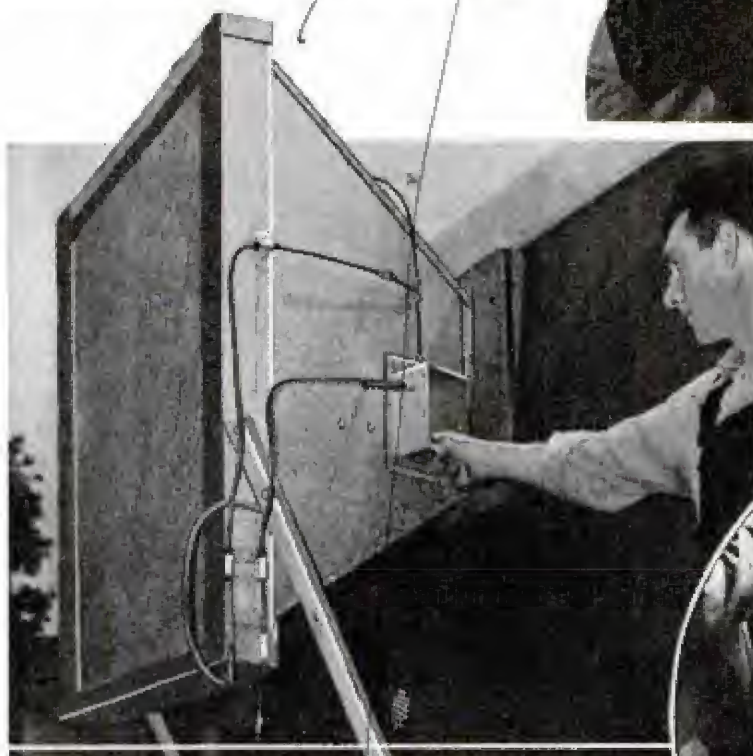


Pushing plow that cuts fire break wide enough to keep fires from creeping or leaping across

Bender Aviation Corp.
Marine Ldw 754
For aviation Air Products

Air Cooler and Filter Adds Comfort to Driving

Relief from summer heat inside the automobile is offered by air coolers and filters operating on the evaporation principle. A step toward air conditioning, two designs are available for automobiles and trucks, and a third is homemade for use on trailers. The passenger car cooler is hung on the door without damaging the finish, and uses an airplane win-



Above, homemade cooler for trailer. Right, manufactured unit on auto, top, and on truck, below

dow to close the opening. Air drawn through the unit by a fan passes through a fine mist where it is cooled by absorption of water and also is washed in one operation. Simply fill the water tank, turn on the switch, and cooling starts. The truck air cooler is placed on top of the cab and depends on motion of the vehicle to force air over a pad of dampened excelsior and then through the rear window. Dripping of water on the pad is controlled by the driver, a set of louvers controlling the air intake. A trailer owner constructed a funnel-shaped box to fit on the rear window of his trailer. Here again excelsior holds the water, and a blower fan in reverse position pulls outside air through the cooler and into the trailer. Water from

a tank inside the trailer is forced to a point where it drips into the excelsior. A regular automobile battery is the power source for operating both the water pump and air blower. Each of the units can be detached easily from the vehicle in the autumn when cooling is no longer needed.

❑ A safer bullet for use in shooting galleries is made of spongy, fibrous lead that disintegrates when it hits, ending the hazard of flying fragments.

Made by J. B. Woodford
Science Service
1413 W. 30th St.

2 791
 Apr. 3, Buckingham A.F.
 4322 Second Road, Phoebe
 Keeping the **IRON HORSE**
 Washington, D.C.

Photos of Western Union Telegraph Co. Railroad Baltimore and Ohio R.R. Transportation Co.



GOING home for Christmas? Jimmy Rice is. But his boss has told him he must work right up until closing time Friday. Jimmy's job is in Washington; his home 3,000 miles away in San Francisco. And Christmas comes on Monday.

Jimmy has counted his money—not enough for plane fare. So he has consulted railroad timetables and when he dashes for the train, he will wire his mother he will arrive at 7:52 Christmas morning.

Notice that "7:52." He didn't say he would get there in time for dinner, or at eight o'clock. The timetable shaved off those eight minutes, and he knows the train will do the same. He knows, too, that he will not get to Chicago until fifteen minutes before the San Francisco streamliner leaves from a different station. Close figuring here, but he can make it if the first train isn't late. His whole Christmas holiday

Signals as seen from cab of Diesel-electric locomotive, top, and engineer and conductor comparing watches. Below, passing orders to fireman of moving train, and signalmen at work in tower at Union station, Washington

668
 P. & O. R.R. Ltd.
 Capital Ltd.

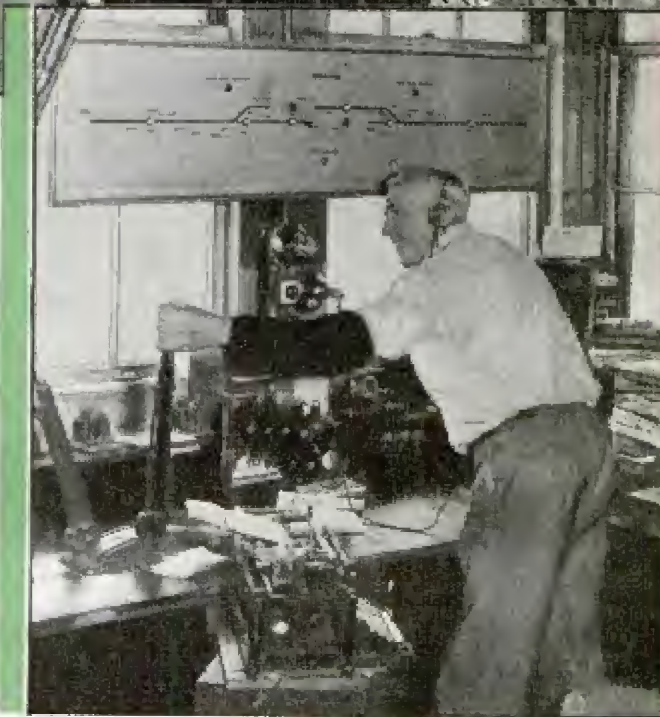
on TIME



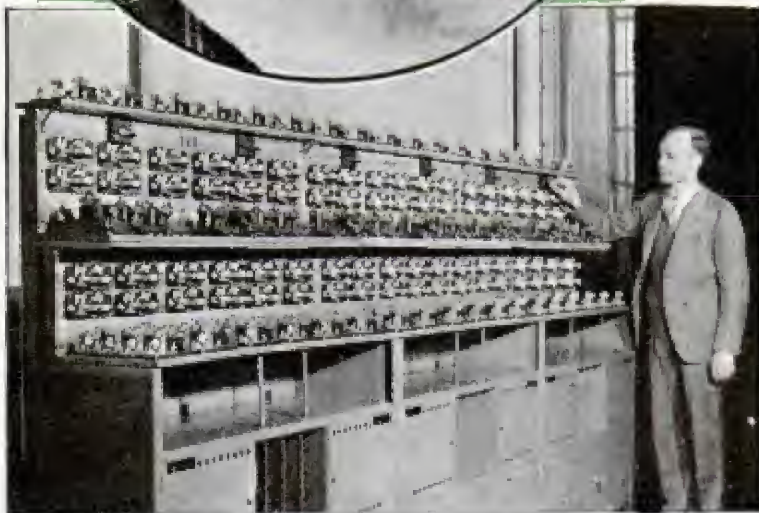
depends on that train being on time.

Millions of travelers every year lay business and holiday plans with implicit faith that those rows of figures in the timetable mean what they say. Seldom are they disappointed. For time is law to the railroad man.

Time to the railroad man is a thing of split-second, uniform accuracy. In every terminal, every dispatcher's office, every signal tower and telegraph office is a standard clock, checked and corrected each noon by telegraphic signals from the naval observatory at Washington, which in turn gets its time from the stars. Every railroad employee connected with the running of trains must check his watch with one of these standard clocks every day upon reporting for work. Once a month he



Hump yard, top, where freight cars are switched from track to track as they roll down hill, and control board in hump yard. Bottom, telegrapher working switches and signals for passing siding



Dispatcher, top, at panel where signals and switches for many miles of track are operated. Cab installation, center, which repeats trackside signals. Bottom, apparatus which flashes correct time simultaneously to hundreds of points

Western Union
must take his watch to an official inspector for comparison, and twice a year for a thorough inspection.

And just any watch won't do. It must be a standard railroad watch of specified size,

with a minimum of twenty-one jewels—the product of any one of four American manufacturers selected on their reputation for making accurate timepieces. And a stemset watch is ruled out because the hands might accidentally be moved; a mishap impossible with the required lever set.

Now let's see how the railroads manage to get Jimmy across a continent—and on time. We see the engineer and conductor, standing beside the shiny locomotive, comparing their watches. One minute before

the train is due to leave, the conductor turns a key switch in the platform box. This flashes a warning to the gateman who closes his gate, makes sure last-minute passengers get aboard. A light is also flashed in one of a row of numbered circles in the interlocking tower, informing the tower director that the train is ready to start. The director replies by pushing a button, which flashes on the second light at the gate.

This is a signal for the gateman to lock his gate. Doing this lights a second lamp in the platform box, and the third circle in the tower. Seeing both lights burning, the conductor consults his watch, and precisely on the dot gives the

starting signal to the engineer. At that same instant the tower director orders a clear signal given, calls out to the leverman a route through the maze of terminal

(Continued to page 157A)

"Invisible" Light Guides Traffic in Blackouts

Designed to reduce the hazards and terrors of night air raids, during which whole cities are darkened for hours, an "invisible" light projector has been invented. The projector throws a narrow beam of light that is visible only when the observer is directly in its path. It is invisible to enemy airplanes. The light gun is useful as a guiding lamp for motor traffic. Since only one lamp is visible to the driver at a time, he knows that he is in the correct position on the road.

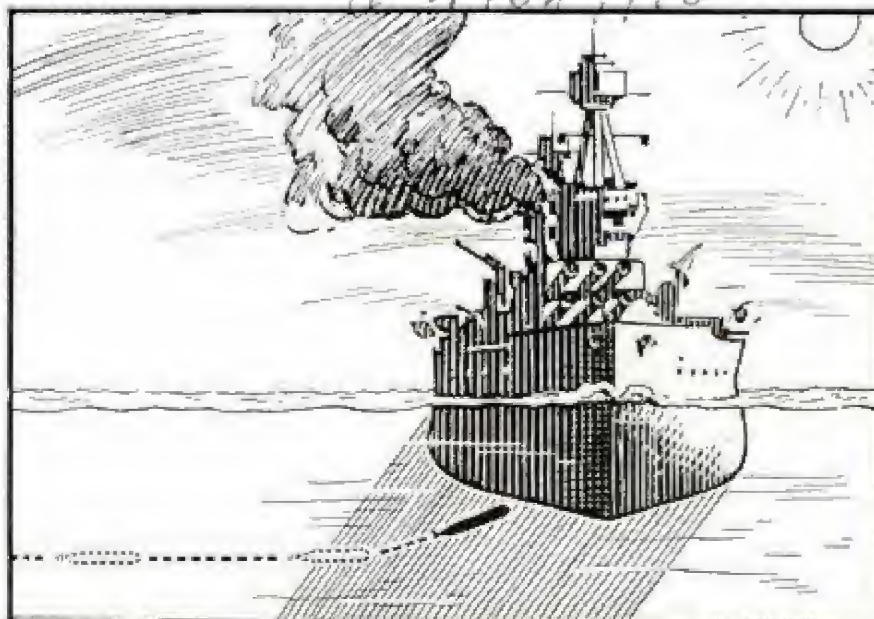


Above, using the beam projector as a signal device. Right, the light gun installed to guide motorists during blackouts



Torpedo with "Eye" Strikes Under Ship

Deadly in its attack against vessels is a torpedo invented by John Hays Hammond, Jr., which includes an electric "eye" that directs it against the bottom of the ship's hull and there explodes the charge. It is the answer to the use of "blisters" on warships that render submarines less effective against them. The purpose is to strike at the most vulnerable point of the hull—beneath the center of the ship. Running at a depth several feet below the ship's draft, the torpedo is caused to veer sharply upward when the light sensitive arrangement has passed into the shadow of the ship. At the same time mech-



Torpedo entering ship's shadow is nosed upward by its light sensitive mechanism, as shown by drawing. Explosion occurs near center of vessel

anism is started operating to detonate the torpedo near or in contact with the hull of the craft. To prevent premature explosion in the event it passes beneath debris, a delay action circuit is incorporated so that the photocell must remain in the shadow a predetermined length of time before the mechanism will go into action. An important advantage in running torpedoes at a greater depth is the added difficulty to detect them, since air bubbles rising in their wake are farther behind.

Seven-Year-Old Engine Breaks Water Record



Above, Sir Malcolm Campbell in cockpit of his "Bluebird II." At right is powerful speedboat roaring over Lake Caniston in test run



~~Coniston~~ in Lancashire, England. Using a seven-year-old 2,500-horsepower Rolls Royce engine, he hit a top speed of 142.85 on the south run, and swung back over the route at 140.62. The achievement shattered his own previous record by 10.81 miles an hour. Sir Malcolm plans to equip his "Bluebird," which is a three-step hull design, with an engine capable of 200 horsepower more, for a future attempt to push the record still higher.

All water speed records were broken by Sir Malcolm Campbell when he drove his new twenty-seven foot "Bluebird II" at an average of 141.74 miles per hour over Lake

All-Purpose Fighting Tank Has Tractor Drive and Wheels



Here is the tank traveling over rough ground, with the tractor drive in contact with the surface

Equipped with wheels for smooth roads and a tractor drive for rough terrain, a German tank demonstrated recently is designed for use in mountainous country. While the tractor drive is in use, the wheels are held in elevated position. Fairly high speed can be attained when the wheels are lowered into contact with the road.

Six million big game animals inhabit the United States, it is estimated from figures of the last Bureau of Biological survey, deer leading with a total of five and one-third millions.

8/27/39

Phosphorus 'Flower' Hides Army Maneuvers



Screen of exploding phosphorus, "erected" by chemical warfare division, effectively conceals from view of enemy ground observers the movement of troops behind it

Chemical warfare has its defense aspects as well as its offensive power. At the Edgewood Arsenal in Maryland recently the chemical warfare division exploded a

quantity of phosphorus during troop maneuvers. It burst across the ground like a vast, luminous flower, effectively screening the movements of the soldiers from view.

Towboat Lowers Pilot House to Duck Beneath Bridges

Built for operation in the vicinity of Chicago where bridge clearances are limited, the towboat "Benwick" can duck under the bridges instead of waiting for them to be lifted. This is accomplished by mounting the pilot house on a rotary hydraulic elevator, powered by an electric oil-pumping mechanism installed inside the jack plunger. With this type of construction the pilot house may be raised to provide good visibility when navigating in open water and lowered below the clearance line to pass beneath bridges, saving the time it would take to slow down for them to open.



Pilot house, shown in "up" position for observation, can be brought down to clear low bridges by simply pressing button

Chemists have extracted a protein powder from whey, by-product of cheese, and whipped it with water to produce a substitute for egg whites.

Science Service
7/19/39

Gold... J. J. Stanger
Hardware...
Installed by Maynilow
Cable...
Rotary

Resumpt by Abraham
Levin
Washington
Bureau
of
air
ou

International
Left Co.
Rotary
Maynilow
Cable
Installed by



*Master Super
William Badders*

In the recompression chamber, left. Even before tenders pull off his suit, the diver starts breathing oxygen after reaching the surface. Below, groggy diver being helped to the recompression chamber after being brought to surface. Bottom, timer watching diver's elapsed time while man at loudspeaker telephone stands ready to order diver to come up

John Mahalowski



Master Super J. H. McDonald

FORTY FATHOMS DOWN



By Nat A. Barrows, 195

Barrows and Wentworth
PART II *Mass*

THE ocean bottom 240 feet down is no place for a greenhorn. Only by long and careful training, gradually learning how to handle increasing amounts of pressure, can a man work at 240 feet and live to dive another day. A head-first tumble, a tear in the suit, a dose of carbon dioxide inside the "hat" and sudden, horrible death may overwhelm the hapless diver.

At 240 feet, the depth at which divers worked on the sunken "Squalus," off the New Hampshire coast, the pressure is so great that a cork will not float to the surface. Instead, it squeezes into a tiny hard pellet. A small piece of light wood turns into a toothpick. The ocean's crushing

Falcon rapid separator

at Brooklyn Navy Yard: master diver, Arsen Crandall

9805



Above, machine which blows air into pontoons used to raise submarine after they are sunk. Right, a master diver overhauling one of the salvage pontoons which was used to raise the "Squalus"



with the **DIVING NAVY**

force, in fact, is enough to make a 1,450-ton submarine, the size of the "Squalus," actually one-eighth of an inch smaller all around the hull.

Yet, the trained diver, controlling his breathing pressure by the way his helmet and breastplate push or lift on his chest and shoulders, can stay down safely at such a depth as long as half an hour with compressed air, or considerably longer under helium-oxygen.

The fact that man, composed of eighty per cent water and fifteen per cent fat, can live even a split second 240 feet down is due, first of all, to his waterproof diving dress, which is today essentially the same as the suit brought out a century ago by the Englishman, Siebe. Without such a covering, a diver sliding down the descending line to 240 feet would become pulp

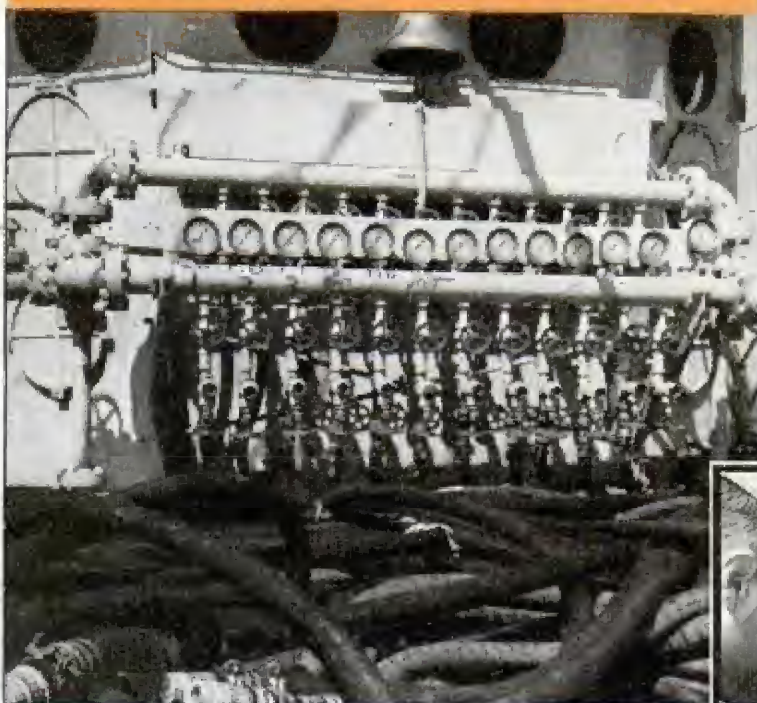
before he ever knew what had happened.

The suits used by the U. S. Navy, and throughout the world, are of rubber, faced with heavy, waterproof canvas. The saddle-shaped, metal breastplate fits the neck and rests on the shoulders, with an overhang well down the chest. To the breastplate the helmet is fitted, attached by an interrupted screw thread that makes the connection watertight. A snap safety lock keeps the helmet from unscrewing. The air-supply hose and the combined telephone cable and lifeline lead into the helmet, after crossing on the diver's chest and passing under his arms. The air-control valve is placed on the left, over the heart, to be used by the left hand as the diver needs more pressure.

"Away with the pressure—turn the control valve away from you; bring the pres-

Squalus
Salvage
Squad
Fallen
Commander:
Fusler, Salvage Officer.

Reference: Lieut.
J. L. A.



Diver, top, ready to descend to the "Squalus." Above, control board on "Falcon" from which air was shot down to pontoons. Right, adjusting diver's helmet

sure to you—turn the valve toward you," say the divers to shaky neophytes.

At the point where the air-supply line opens into the top of the helmet, an automatic non-return valve gives the diver a chance for his life in case the air line is ruptured or accidentally shut off. By closing the exhaust valve, at the right side of the helmet, the diver can keep enough air in his "hat" to insure some chance of life until the tenders haul him to the deck and rush him to the "iron doctor."

Ruptured air lines do happen, and it is a lucky diver who escapes without a serious case of the bends.

As a rule, the diver does not need to touch his exhaust valve often. It is adjusted so that pressure inside the helmet is slightly above pressure of the water. Thus, more pressure comes in the air hose than escapes through the exhaust vent.

If the carbon dioxide expelled by the diver begins to build up inside the helmet, exposing the man to the acute danger of unconsciousness, two remedies are available. Either the regular exhaust valve controlled by hand, or the button exhaust, controlled by a shove of the diver's chin may be used. This button is a handy affair when the diver has both hands occupied.

Protected by his suit and weighed down to keep from floating away, the diver working in great pressure depths is able to live because the increased pressure, introduced into the lungs by breathing, is evenly distributed throughout the body by the blood stream. In other words, the pressure inside the body is made to



balance the pressure of the ocean outside.

When the blood leaves the lungs under pressure it is saturated with the major gases—nitrogen, oxygen and carbon dioxide. The oxygen combines loosely with the blood hemoglobin and leaves but a small amount remaining in physical solution. It is the nitrogen-gas saturation in the blood that causes trouble. The body quickly and easily accommodates it-



Chain used in "Squalus" salvage job. Each link weighs seventy-six pounds. Top, cutting one of the chain links, two and one-half inches thick

self to rapid changes of pressure, and to the subsequent high saturation of nitrogen.

But the elimination of this gas must be slow to keep it from forming bubbles before the blood stream can carry it off safely through the lungs. Since nitrogen makes up about seventy-five per cent of all the gases in the blood, it is the major problem in desaturating a diver after high pressure.

Unless the pressure is reduced gradually, the nitrogen gas turns into bubbles—and

the diver soon is screaming with agony as the racing bubbles pile up in the bloodstream bottlenecks at the joints and the base of the spine. Before scientists discovered the principle of nitrogen gas in saturation, divers died in terrible pain, or came up from the bottom paralyzed and blinded.

Today, with divers guided by exact decompression schedules, a case of the bends is rare, indeed, except after accidents. The use of oxygen masks has greatly shortened the time of decompression, since in breathing oxygen at a determined pressure the diver is taking in no nitrogen that has to come out of the system again, and the nitrogen already in the blood stream can continue to desaturate undisturbed. By shorter underwater decompression of divers, the diving platform is cleared for other divers, the danger of line fouling is lessened, and each diver is able to reach the warmth and security of the recompression chamber on the tender ship in less time.

Bends lurk always in the wake of deep-sea divers, even with the use of helium-oxygen instead of compressed air. Its dangers, however, are considerably lessened in these days of increased knowledge of how to handle divers.

A "blow-up" is one of the most serious accidents that can befall a diver working in deep water. If he gets too much pressure in his "hat," the diver balloons his suit. Then, unless he works cleverly and

(Continued to page 124A)

Q 881
678

Schemetady, N.Y.
**"Cold" Light for Television
Is Cooled by Water**



Sally Eilers, movie actress
Water-cooled mercury arc lamp, small as cigarette, provides light with less heat for television studio

One of the problems of television engineers has been to provide double the studio lighting required by the movie cameras without creating unbearable heat on the "stage." The answer was found in water-cooled quartz mercury arc lamps that give twice as much illumination as a similar wattage of incandescent lamps but create only one-tenth as much heat. Three quarts of water per minute pass through the quartz jacket around the small lamp, taking away ninety per cent of the heat.

2970
**Atmosphere Shields the Earth
from Meteorite "Bullets"**

*Science Service
Aug. 19*
Were it not for our atmospheric protection, we would have an aerial bombardment so severe that life could not exist except in the depths of the sea, declares Dr. W. H. Nichols, chief curator of geology at Field Museum of Natural History. The earth is daily the target of millions of meteorites, so small that they are completely

consumed in the upper air, miles above us. These are seen only as luminous trails of shooting stars and meteors, most of the trails being so faint that they cannot be observed without a powerful telescope. The great majority of meteorites weigh from a few ounces to a fraction of a grain, but even a particle weighing less than a grain and moving with the speed of a meteorite would pass completely through a human being, explains Dr. Nichols.

2895
**Suction-Cup Seal for Food Jar
Is Easy to Open and Close**

Made possible by the invention of a unique sealing cap, food can be stored in airtight jars which are sealed by a simple tap with the hand. They are opened quickly by lifting the thin rubber edge of the lid with the fingers or a small object such as a toothpick, to admit air. Suction is created by a groove that circles the edge under the cap. A broad rim at the top of the jar forms a seat for the lid. The wide-mouthed containers and rubber covers are easy to wash and sterilize. When used as refrigerator sets they stop discoloration of fruits, prevent transfer of food odors, protect against spoilage, eliminate drying out,



Suction ring seals cap onto broad rim of jar. Top, vacuum inside jar holds cover against strong pull

Chicago

*merchandise mail
1112
Perfect Seal Sales Co.
Chicago*

and seal in the freshness and flavor of stored foods. They are ideal for the cold-pack method of preserving food, since it is not necessary to handle the hot jars when applying the tops. A vacuum inside the jar helps make a stronger seal, which may be so strong that a straight pull of more than 225 pounds is required to dislodge the cover—yet it lifts off easily if air is admitted under its edge.

Glass Block "Sandwich" Diffuses Light

Transmission of solar energy into buildings through the walls is reduced sharply by a new glass building block containing an interior screen of glass fiber. Eliminating glare from the sun results in a softer natural daylight, and the decrease in transfer of solar heat cuts down the cooling load in air-conditioned rooms. In the new design a glass-fiber sheet is sealed between two hollow glass squares, forming a light-diffusing screen in the center of the block.



Glass-fiber sheet sandwiched between square glass "cups" diffuses sunlight and keeps out glare

Three-Eyed Electric Lamp Blends Two Types of Bulb



Two incandescent lamps and one mercury-vapor bulb are combined in one unit to produce this efficient street lamp

Incandescent and mercury-vapor bulbs blend their light in a three-eyed electric street lamp just developed. Flanking the 400-watt mercury lamp are two 200-watt incandescent lamps, producing together an effective light for outdoor use.

Self-Locking Shields for Corners Are Applied without Tools

No tools, nails or screws are needed to install a corner shield now on the market, as it is equipped with a spring steel clip having sharp points that hold it in place. Simply set the shield in the corner of a stair, drawer, shelf or cabinet and push it down firmly with the thumb. This locks it permanently in position and the maker claims it will not work loose.



Pittsburgh Plate Glass Co. 222 E. Grant Bldg. Pittsburgh Pa. Chicago - The Fair

EXPLORERS OF



bring the moon visually to within twenty-four miles of our own world.

Already science knows enough about the moon to enable people to travel there—in imagination. By carefully assembling many facts already known about the lunar body and by dramatizing them with modern apparatus which includes scenic, sound and lighting effects scientists have made it possible to embark on a lunar expedition right in the center of New York City—at

By Emile C. Schnurmacher

ALMOST since the dawn of time, man has wondered about what was on the moon and in the stars. In imagination he has peopled the heavenly bodies with weird beings, incredible animals and grotesque foliage. Today his desire to roam the universe has at least been partially fulfilled. Only instead of leaving the earth to do so, science has reversed the process and brought the universe to the earth by means of the telescope and enacted dramas of the heavenly bodies in modern planetariums.

When Galileo devised his crude "optick tube" he discovered the four large moons of Jupiter, the phases of Venus, the spots on the sun and brought the mountains and craters of the moon to within 7,500 miles of the earth. Today with science's newest gift to the astronomer, a 200-inch telescope nearly ready for use, the promise is to



Observing the heavens through 100-inch telescope (top). Imaginary rocket ship after landing on surface of the moon. Note earth in sky

SPACE



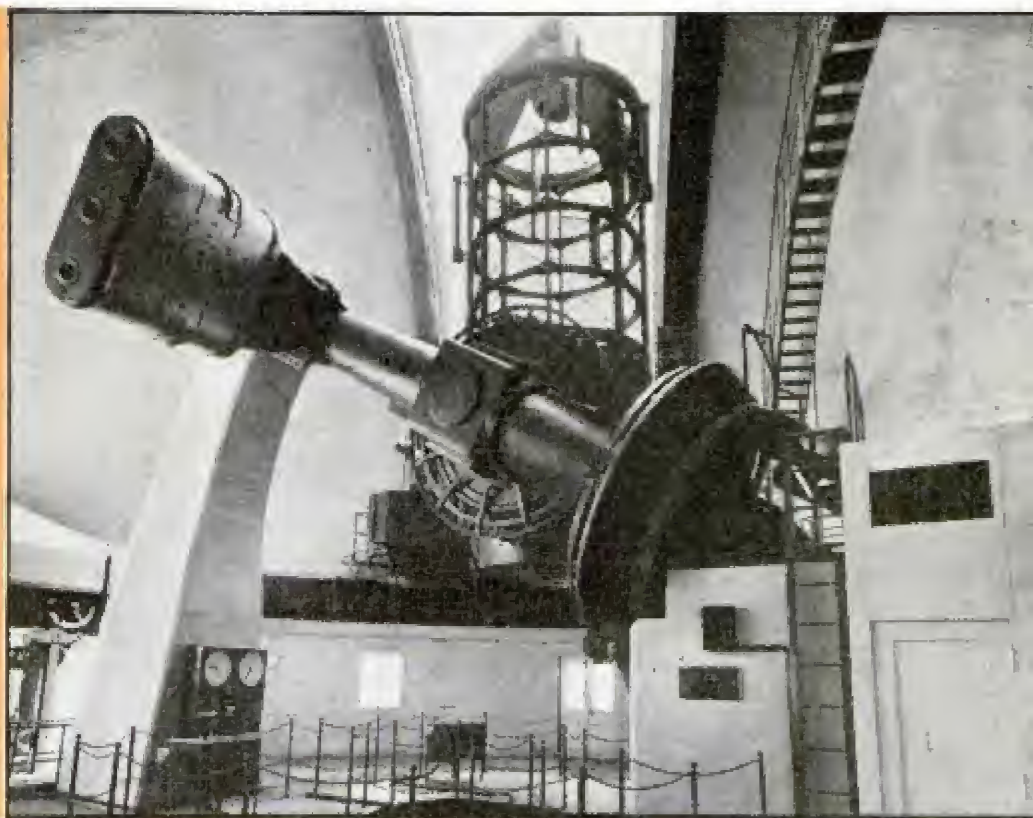
the Hayden Planetarium.

One such imaginary journey, an expedition "to observe an eclipse of the sun from the moon" took the planetarium staff, assisted by government workers under the direction of Professor William H. Barton, Jr., nearly three months to create and coordinate. Nearly 20,000 square feet of moon crater scenery had to be painted upon parchment which then had to be mounted in frames to obtain multiple lighting effects worked out by technicians. Several special projectors had to be built to faithfully reproduce the appearance of the earth as seen from the moon—its changing phases, the red halo at the time of eclipse and the faint illumination by moonlight.

The effect of a rocket ship soaring toward the moon at the rate of 250,000 miles a minute, the



Oxygen apparatus that might be required for exploring moon (top, left). This is from UFA movie. Right, Thomas Voter drawing of how earth's gravity might destroy moon, causing it to bombard earth. Bottom, eighty-two-inch telescope at McDonald observatory





Above, imaginary representation of disintegration of the moon upon approaching earth too closely. Drawing is by Walter Favereau. Right, Howard Russell painting of earth as it probably appears from the moon. Bottom, Dr. Clyde Fisher of Hayden Planetarium

ultra-scientific craft in which the spectators make their imaginary journey, was a particularly obstinate problem which had to be surmounted by trick photography. Transformed into the control cabin of a super-space ship it is equipped with large, complicated control panels, with flashing lights and luminous dials and enormous wheels and gears such as a space rocket, the size of a battleship, might have. It "takes off" with a thunderous explosion followed by the hiss of combustion gases from the propulsion valves. As it whizzes in imagination toward the moon at the speed of 250,000 miles per minute, the lunar body seen through the windows in the control cabin looms larger and larger until it finally commands the entire view of the passengers.

As the space ship reaches the moon, the spectators are taken for an imaginary cross-country flight over the craters, mountains, rifts and "seas" which form the fantastic lunar-landscape. Next the rocket lands and in a split second the explorers are transported from the cabin to a lunar crater on the moon, surrounded by tall white mountains glaring in blazing sunlight. Since this journey supposedly takes place on April 18th, 2144, the explorers see an eclipse of the sun from the moon which brings into play a series of spectacular lighting effects. Some of them show how the craters may have come into existence through meteoric bombardment or volcanic outbursts.

Because there is little, if any, oxygen on the moon the adventurous explorer is equipped with a light helmet as he leaves the protection of the ship. Immediately he finds himself in a strange world. There is a hushed, deadly stillness about him, for the moon has no atmosphere and since sound depends upon vibrations in the atmosphere, there is no sound. If he should chance to find some hardy species of plant life—and there are astronomers who believe that there may be a type of lichen adhering to the



crater walls, it would have no odor, for that too is carried by the atmosphere.

Stretching his legs after his long journey, the lunar explorer may run along with thirty-foot strides, for his "earthly" weight of 180 pounds has been reduced to thirty pounds, the moon having only one-sixth of the earth's gravity.

It is possible because of this low gravity too, that he may see great lava-formed mountain ranges two and three miles high, for some scientists believe that when numerous volcanoes erupted in the distant past, they shot their lava contents skyward for tremendous distances. Others believe that the craters on the moon may have come into existence through meteoric bombardment. Should the explorer chance to come upon any relics of a long dead race, he would probably find them in a perfect state of preservation and, should there have been any kind of intelligent being who once inhabited the moon, the dwelling he lived in would be exceedingly strange as measured by earthly standards. As there is no rain or snow to fall on the lunar body, a house would probably be roofless.

Leaving the moon and the year 2144 and projecting themselves millions of years into the future, scientists can predict, and show, from the safe vantage point of the planetarium, one of the possible roads to doomsday and the end of the world. Just what will be that end? The astronomers do not know but their various predictions based upon scientific observation, collated and dramatized by the planetarium, show several possibilities, always taking into consideration the uncertainties of the universe which, contrary to the popular belief, is not as "fixed as the stars."

One possible end of the world, millions of years from now, may be caused by the sun becoming

(Continued to page 122A)

Lawn "Buggy" Saves Steps and Travels Twice as Fast



Wheel chair hitched to mower covers ground at double speed

With several acres of turf to mow in the football and baseball fields at University of Oregon, a grounds keeper has equipped his lawnmower with a seat, enabling him to travel six miles an hour, compared to three miles afoot. Material used in its construction consisted of an old-fashioned wicker wheel chair and some steel rods and wooden braces.

Tractor Pulls Portable Tanks on Wheels to Water Orchards and Fields

By using portable tanks on wheels, farmers have found a way of watering their orchards and fields. The mobile tanks are drawn by tractor. Fruit trees are moistened individually, with mulch being placed at the base of the trunk to conserve moisture.



Tractor-drawn water-wagon train being filled at a roadside tank

Used by Mr. J. S. Hurd
6000 1st St. N.W.

2nd. Mike Steddom

"Eye Chart" for Television Helps Get Sharp Image



Chart used by General Electric engineers in adjusting television camera to obtain sharpness in images

Television cameras are given "eye tests" to obtain proper detail in the final images, in much the same fashion that human sight is measured. A chart with horizontal and vertical figures, instead of various sized letters, is placed before the television camera, and the accuracy and sharpness with which the figures register on a receiver indicate whether any changes or adjustments in the equipment are required.

Rubber Band Flips Newspaper from Car to Reader's Home

Throwing a newspaper from a sedan-type automobile to the customer's porch was the problem that an Indiana carrier solved by using pieces of inner tube. With



Newsboy speeds deliveries by propelling paper to customer's porch with "slingshot" on door of auto

a heavy piece of the rubber stretched across the window opening of the car, the carrier bends a folded newspaper over the rubber band and shoots it a hundred feet or more, in the manner of a slingshot, with great accuracy. Seldom is it necessary to stop the car, so sure is his aim.

Top-of-Stove Bun Warming Pan Vents Moisture through Lid

Cereals, crackers and bakery goods can be crisped and freshened in an aluminum bun warmer on the stove top. It has a small vent in the lid which can be opened to let moisture out when crisping is de-



Wire basket in bun warmer keeps food from scorching, and vent in cover opens to let out moisture

sired, or closed if the moisture is to be retained in the food. There is a wire basket in the pan to hold the food. Potatoes can be baked in the utensil, saving the less economical oven heat.

Weekly Cycles in the Weather Are Linked to Sunspots

If your Sunday picnics are ruined week after week by rain, you can blame the sunspots. The nation's capital is one of the places that gets its weather by the week, so if it rains on Sunday it is likely to rain on several Sundays thereafter. The cycle is not exactly a week, but six days and eighteen hours, explains Dr. Charles G. Abbot, secretary of the Smithsonian Institution, and it amounts to just one-fourth

Washington, D. C.

the time it takes a group of sunspots to make a complete rotation around the sun. This indicates that the weather phenomenon may be connected in some way with sunspots, says Dr. Abbot. Since the period is one-fourth of a day less than a week, the rainy Sunday "curse" can be expected to shift forward one day in about a month—and that actually happened during June and July of this year. As a result of his study, Dr. Abbot predicted that June would have rainy Sundays and Tuesdays, and July rainy Saturdays and Mondays. In June maximum rainfall was on Tuesdays, and during July on Saturdays.

Fan on Lawn-Mower Handle Blows a Cooling Breeze

Why get hot at the summertime job of mowing the lawn? An English resident who wanted to keep cool at work transferred the blades of an old electric fan to the handle of the lawn mower. A pulley attached to the mower wheel and a few gear wheels put in the right places keep the fan blowing a pleasant breeze.



Fan blades on handle of lawn mower stir up breeze to cool worker while she pushes cutter under hot sun

Portable Tester for Battery Checks Electric System



Ills of battery and car's electric system show up quickly on this tester that hooks to terminals

Checking the car batteries takes no more time than the routine checking of oil and water when a portable tester just put on the market is used. It does not require removal of the battery. The leads are connected to the terminal posts and both the battery and the automobile's electric system are tested in one operation. It weighs ten pounds.

Chicago Built on Coral Reefs Millions of Years Old

Studies of the bedrock in the Chicago region have revealed scores of coral-reef structures, some of which are as much as three miles in diameter, others being as small as thirty feet. Geologists explain that they were formed hundreds of millions of years ago, when warm seas covered interior North America, during the Silurian period of geologic time. A number of the reefs still rise well above surrounding land surfaces and can be examined where quarries and canal excavations have exposed the rock.

Cont. Elton L. Carroll.
402 W. Washington
21-2

369 Lexington Ave
New York City

Tire Marker on Police Car Checks Parked Autos



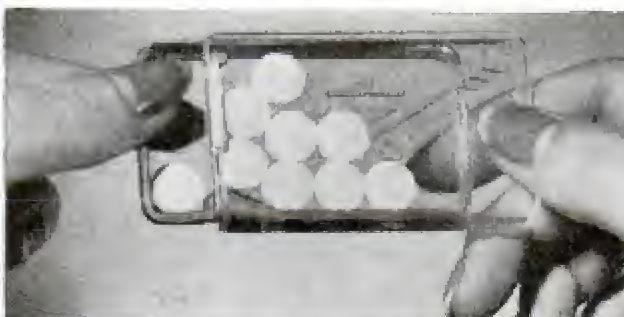
Milwaukee Journal photo

Chalk stripe painted on tire by police car's automatic marker helps speed check of overtime parking

Officers riding in squad cars or on motorcycles can check the parking time of automobiles by equipping their machines with an automatic tire marker, thereby taking over the duties of patrolmen who do the work on foot. The device is controlled by a push button connected to the instrument board. Pressing the button causes the tire marker to extend outward from under the running board, and on releasing it the arm recedes to its original position leaving a chalk mark on the tire.

Pills Delivered One at a Time by Automatic Holder

One tablet at a time is delivered by a transparent pill box through its gravity chute when the cover is open. In this position the tablets are crowded back into a smaller closed compartment which has a



Transparent pill box permits only one tablet to be delivered at a time while cover is open

tiny slot through which they slide one at a time into the small opened part of the case which serves as a tray. When the cover is closed the interior of the box forms a single container. Made of non-breakable plastic, the pocket-size holder is refillable.

Bell of New Nine-Metal Alloy Rings Clear When Red-Hot

Two metal bells were heated bright red in an electric furnace at the Westinghouse research laboratories the other day. When they reached 1,100 degrees Fahrenheit they were pulled out. An engineer tapped one bell, of ordinary steel. There was only a dull thud, as if it were of concrete. He tapped the other. It rang with a brilliant



Heat dulled the ring of ordinary steel bell at left, but alloy bell rang clear when red-hot

tone. It was made of a new metal, dubbed "K-42-B," a combination of nine metals and the result of more than five years of experimenting in the hunt for a strong and heat-resistant alloy. It has proved its ability to stand up under temperatures as high as 2,912 degrees, 200 degrees hotter than the melting point of copper, and is stronger at 1,100 degrees than carbon steel is at room temperature. In it are the elements nickel, cobalt, chromium, titanium, iron, manganese, aluminum, silicon and carbon. Its originators foresee a future for "K-42-B" in the manufacture of dies, steam fittings and perhaps turbine blades.

☐ Rubber auto-license tags with metal numbers attached, invented in Germany, are claimed to do away with breakage and therefore remain readable longer.

Science Service

SAVING LIVES with a SURFBOARD

Fred Peterson



From Hawaii comes latest aid to seaside life-saving. The paddle board, adaptation of the surfboard, is being used by every lifeguard service in southern California

Dispatcher, circle, relays call for help to lifeguard, above, who spots the swimmer in distress. Right, another lifeguard sets off on paddle board, on which he can travel twice as fast as he could swim. Below, he paddles to catch a breaker after pulling the girl onto the board and starting shoreward

Edward Peterson

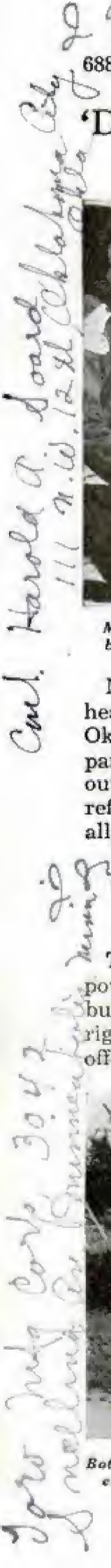


Acme

Left, the rescue craft reaches shore, the lifeguards pick up the girl, using board as stretcher, and rush her to where artificial respiration may be applied. The lifeguards find the paddle board maneuvers more easily than a boat

Toro July Corp. 3042
Sneland Co. Birmingham

Cmt. Harold A. Board.
111 N.W. 12 St. Oklahoma City, Okla.



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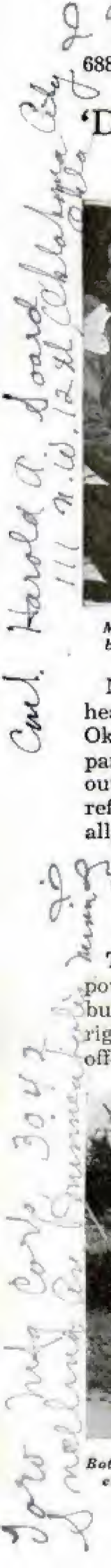
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Toro July Corp. 3042
Sneland Co. Birmingham

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left bar is operated by an air-cooled one-cylinder engine. Both bars are raised and lowered in two and one-half seconds by power, with ordinary shift levers as controls. The machine thus equipped can operate on congested center-strip parkways. The tractor has a six-cylinder engine and four-speed transmission ranging from three to forty-five miles an hour.

9901
Spiral-Slotted Reel for Cut Film Protects Negatives in Tank

To keep photo negatives from rubbing against each other in the developing tank, and to assure that all parts of the negative are reached by the developing solution, a spiral-grooved reel for cut film and film pack is offered. The negative slips into one

Steel only 2.50
 with tank 2.50
 Paid



Top, spiral-slotted reel assembly. Note, below, how easy it is to insert negatives into slots

of the fanlike spiral slots and is protected from buckling or contact with other films. The reel is adjustable for negatives from thirty-five millimeters to two and one-half by three and one-half inches.

Found in gem mines of Brazil, a 350,000-carat topaz crystal, the largest ever known, has been added to the mineral collection of the Smithsonian Institution.

Washington, D.C.
 8/18/39

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ECHANICS
303 Washington St.
Newark N.J.

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Too low to permit passage of the twenty-ton glass disk being transported to Mount Palomar, Calif., a railroad trestle was cut open by the removal of an entire track section. House-moving technique was used by workmen in handling the special cradle of steel which carried this disk, measuring 200 inches in diameter, the largest single piece of glass ever produced.



Section of railroad trestle removed to allow passage of giant glass disk on its way to observatory in California. Note how "cradle" is moved on rollers.

Remove rear wheel, pedals and sprocket of your bicycle, attach a motor-driven wheel and parcel carrier and you have a motorized delivery bike that will travel 120 miles on its one-gallon tank load of gasoline. The unit, just put on the market,

is easily installed on any bicycle frame or the complete motor bicycle can be obtained. The one and one-half horsepower motor drives the small rear wheel through chain and belt, with clutch and gas controls on the handlebars.

Diamonds fall from the sky, it has been proved by an X-ray examination of hard, black crystals in a specimen from the meteor crater in Arizona. The specimen was obtained by Smithsonian Institution and turned over to mineralogists of the geophysical laboratory of Carnegie Institution for examination. Although not of gem quality, the particles are good black diamonds of the kind used in industry, being even more valuable than medium-rate gems. Many years ago, when the presence of diamonds was suspected, futile efforts were made to drill into the meteor crater in the hope that a big diamond mass would be discovered. After going down for about 1,200 feet the drills hit material which they could not penetrate. Efforts to sink a shaft were defeated by striking water.



Motor scooter mounted in place of rear wheel has handlebar control and powers handy delivery bike

Mato - I can't help Co.
8440 S. Chicago Ave

278. Mrs. James M. Greedy
431 W. 60th Terrace
Kansas City, Mo.

ANGLING



Left, showing how to divide triangle in making open draw shot. Above, general bridge. Circle, correct grip of cue. Note thumb and forefinger around cue



By Charles C. Peterson
Famous Billiard Instructor

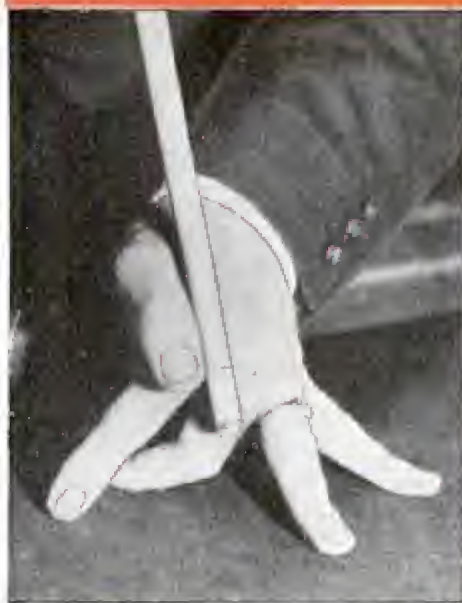
OF ALL the comebacks in sport, none has been more impressive than that of billiards.

A few years ago, it was on the way out. Once only the recreation of royalty, billiards had slipped into disfavor. Certain

improvements in the table that abetted gambling had brought about its decline. With two strikes on it, the sport began beating back. Divorced from undesirable associations, it has really come into its own and now there are perhaps more people playing some form of billiards than any other game, with the possible exception of bridge.

Colleges have become incubators of interest. So rapid has been the game's rise in the field of higher learning that at University of Illinois and two or three eastern colleges, interfraternity billiards has been substituted for ice hockey. Intercollegiate billiards now occupies a place on the winter sports calendar. These competitions were started at the University of Wisconsin in 1931 when a scheme was developed whereby the game could be played by telegraph between schools through a key shot or chart system. Ten of the larger universities participated in the first straight rail tournament and its

for BETTER BILLIARDS



success paved the way for three-cushion and pocket-billiard championships. Six months out of every twelve are devoted to instructing university, college, and high-school students in the game. Before the present term draws to a close, group lessons will have been received by more than 70,000 students at 150 schools, ranging from the United States Military Academy at West Point to Santa Monica high school in California.

Billiards has the educational virtue of sharpening one's powers of both analyzation and visualization. The game handsomely rewards the novice who tackles the fundamentals with an undistracted mind. The player who grips the cue correctly, takes a flawless stance, and patterns his bridge along championship lines is well along the road to better billiards.

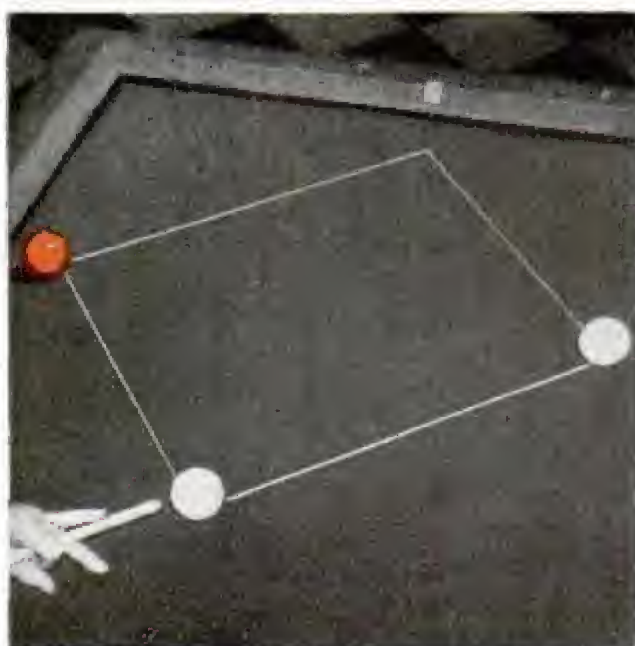
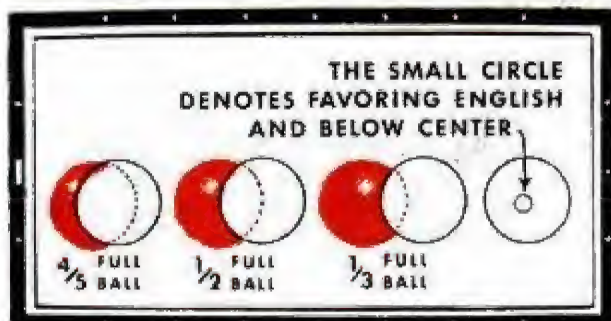
The most satisfactory way of gripping a cue



Top, left to right, firm masse bridge; correct bridge for masse over ball, and shot close to rail, with cue almost level. Center, covered bridge for draw shot. Bottom, follow shot. Draw straight line from first object ball to second object ball, then shoot cue ball in manner indicated

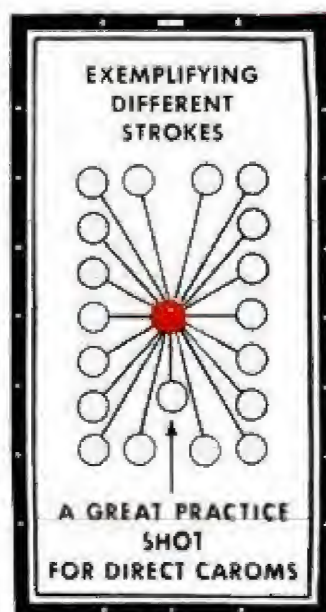


Left, top, author making masse shot. Center, sketch showing proper method of striking object ball with cue ball for various results. Bottom, squaring the angle. Player plays caroms from ball to ball in one and two cushion shots. Right, top, practice delivery of stroke on top of rail. Bridge rests firmly on rail with knuckle flat and leaving it that way



calls for only the thumb and first finger to touch the cue. This contact is light, just sufficient pressure to be firm. It is also essential that the cue be grasped, not at the extreme end, but as close to the balance point as possible. This makes for a shorter bridge and usually results in a smooth, even stroke with the level cue. By holding the cue at the extreme end, a pump-handle effect is produced, the cue point dipping down as it is drawn away from the ball and rising upon approaching it. Under such circumstances it becomes impossible to execute a good draw shot wherein the cue must be driven low and in a parallel line.

No two great players have precisely the same stance or position at the table. But there are certain points which all observe in taking a firm, yet graceful position. The player should face his shot squarely and then turn one half to the right—the body should be bent forward slightly, thus providing room for the right arm to swing without interference. The head should be over the cue, the latter being sighted as one does a gun. The left arm, of course, is extended with the hand resting upon

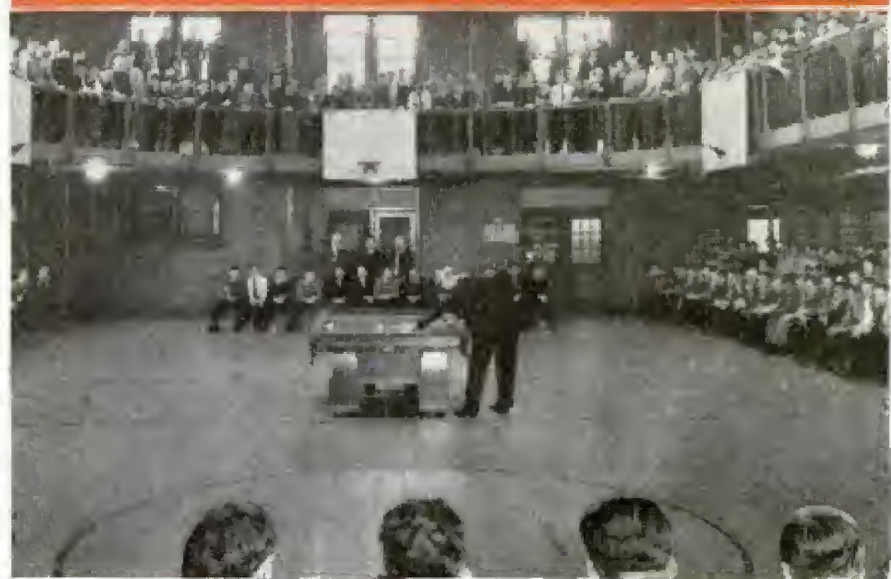




the table, forming a bridge. It is well to remember that the feet should be spread apart slightly to give firmness to the stance. The weight should be evenly distributed between the two feet. Where the pendulum stroke is used, the right forearm hangs almost perpendicularly. Avoid rigidity in your stance or the easy motion of the stroke will be curtailed.

No element of technique is of greater importance than a firm bridge. And this is best attained with what we call the tripod style. Because of the difference in fingers there are variations of the tripod bridge among champions but the basic design is easily recognizable in their games.

(Continued to page 128A)

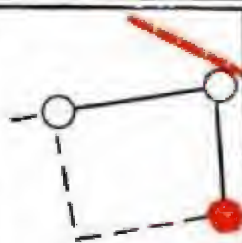


Top, left, handy little pointer. Right, novice may advance rapidly by using the pointer as shown. Below, pocket billiard exhibition given at school. Bottom of page, how certain shots should be made

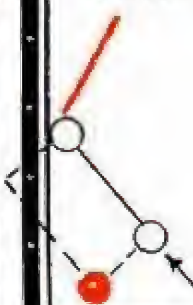
THE IMPORTANT CAROM OR RIGHT ANGLE SHOT PLAYED BY STRIKING OBJECT $\frac{4}{5}$ FULL LEFT. CUE BALL CENTER FAVOR RIGHT ENGLISH



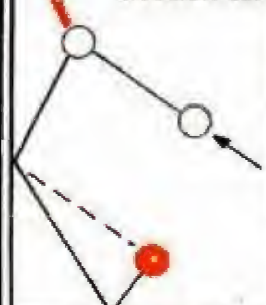
AIM AT OBJECT $\frac{4}{5}$ FULL RIGHT, STRIKE CUE BALL FAVORING BELOW CENTER ENGLISH RIGHT. FOLLOW THROUGH AND KEEP YOUR CUE ON THE LINE OF AIM



AIM AT OBJECT BALL $\frac{4}{5}$ FULL LEFT. STRIKE CUE BALL FAVORING BELOW CENTER ENGLISH LEFT. FOLLOW THROUGH AND LEAVE CUE ON THE LINE OF AIM



SQUARING OFF THE TWO CUSHION SHOTS. AIM AT OBJECT BALL $\frac{4}{5}$ FULL LEFT. STRIKE CUE BALL FAVORING BELOW CENTER ENGLISH LEFT



Derelict Airplane Finds Job Chasing Mosquitoes Away

Artiss 2X9

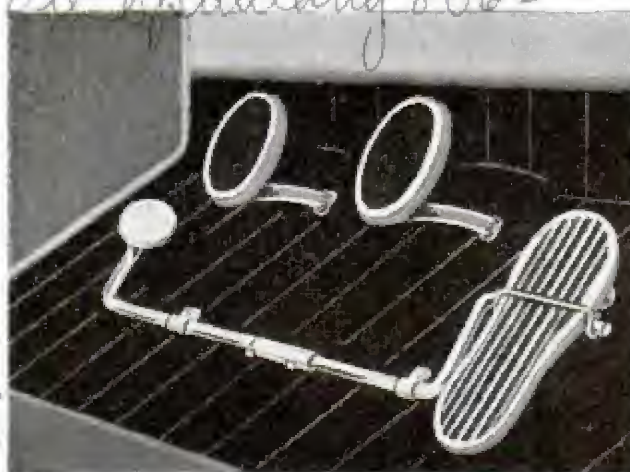


Its flying days over, airplane finds comparatively easy job blowing insects from golf practice tee

Its wings and tail clipped, an ancient airplane has become a derelict—but it still holds a useful job. "Grounded" within a protective wire fence at a golf practice tee near Wold-Chamberlain airport at Minneapolis, the old engine turns at idling speed, its propeller fanning a breeze that wafts away mosquitoes and other insects attracted by the big floodlights.

Accelerator for the Left Foot Attaches to Right Pedal

For relieving right-foot fatigue in driving, an accelerator for the left foot may be attached to the standard accelerator pedal.



Small pedal at left may be used to control fuel flow in traffic or on hill

Thus, the driver may switch from one foot to the other when he begins to tire. In addition, the left-foot pedal may be used when it is desirable to keep the right foot on the brake pedal, ready for any emergency, such as operation of the automobile in heavy traffic. The left-side pedal does not interfere with the clutch.

Seven-Foot Carving of Big Tree Cut from Redwood Slab

Carved from a single redwood slab eleven feet long, four feet wide and two feet thick, a replica in relief of the famous General Grant tree has been in the making nearly six years. Finished, the carving is seven feet tall and eleven inches thick.

Devoting 1,200 hours to the work, Victor



Famous General Grant tree carved in relief on slab of redwood required six years of painstaking work

Kerney faithfully reproduced the big tree even to the fire scars and other details. Known as a giant Sequoia, the tree, which stands in General Grant national park in California, is 267 feet high, with a maximum diameter of forty feet and four inches. Two hundred feet above the ground it measures twelve feet through.

294

Energy of Ultraviolet Tested with Aid of Light Meter

With the help of a light meter, General Electric scientists have developed an easy and inexpensive way to measure the bacteria-killing energy of ultraviolet from germicidal lamps. Both short (ultraviolet) and long wavelengths are emitted by the lamps, and they have to be separated in determining the power of the short waves. It was known that ultraviolet causes cer-



tain materials to fluoresce, and also that quartz transmits the shorter wavelength whereas ordinary glass absorbs this energy. An appropriate fluorescing material, sandwiched between a

plate of clear quartz and one of ordinary glass, is the contrivance that solved their problem. Placing this over the sensitive cell of the familiar light meter, with the quartz side of the device toward the source of germicidal energy, causes the fluorescent material to emit light which the light meter records—but this measurement also includes the energy of the longer wavelengths which pass through. Now turn the glass side toward the lamp, and only the long wavelengths will pass. The difference between the two light meter readings serves as a measure of the germicidal energy.

Ladder Unfolds for Escape from Burning Building



Climbing from burning building on collapsible ladder. Inset shows fire escape folded for storage

Any window is a safe exit from a burning building when it is equipped with a collapsible all-metal ladder just brought out. Made of lightweight aluminum alloy, the ladder folds into a small space for storage. In an emergency it can be attached quickly to the inside of any window and then lowered. The steps are corrugated.

Electric Curb Feeler for Auto Guards Side from Damage



"Feeler" warns by flashing light before car strikes

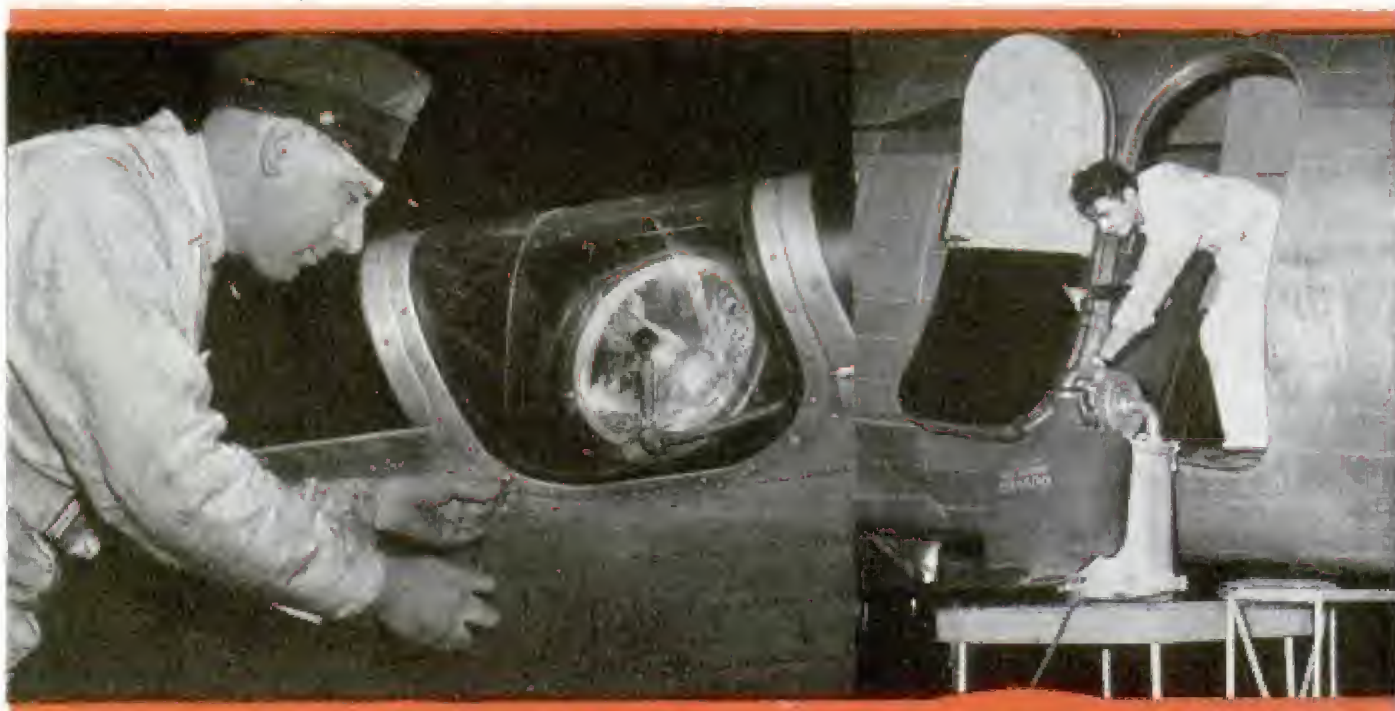
To help automobile drivers avoid scraping against the curbing while parking, a "feeler" that signals a warning before the car strikes is now available. It is an L-shaped arm made of flexible clockspring steel, protruding about six inches beyond the side of the car, and when the horizontal part is bent, even slightly, it closes an electrical circuit to turn on a warning light on the instrument board. Both front and rear bumpers may be similarly equipped.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Emergency Safety Ladder Co. 29, Covington, La.

Auto Mfg Co. 1621

Superman St. Calif



Above, a mechanic's idea of reinforcing wing landing lights with wire has saved much breakage. Top, right, "souped up" vacuum cleaner. Bottom, speed-control unit for Link trainer which applies "head" or "tail wind"

By Don Black

Western
Shayer Ave. Los Angeles
AROUND an airport you frequently hear the expression, "dumb mechanic," but close association with these fellows teaches respect for hangar brains.

Not long ago an executive was complaining because a mechanic spent too much time "trying to figure out the easy way to do things." About a week later this mechanic rushed up to the foreman all excited. "It works," he beamed, "works like a charm. Come and see."

Well, it used to take two men half an hour to put fresh oil into engine crankcases of an American Airlines' flagship being prepared for the overnight coast-to-coast flight. Each of the two motors required twenty-five gallons. That meant hoisting five-gallon cans up by hand and laboriously emptying them one at a time. With three outgoing transcontinental schedules daily, you can understand what this job would be.

What the mechanic did about it was to hook up the auxiliary batteries used for plane-engine starting to a small electric motor, a pump rigged out of spare parts and a couple of oil drums. For quick and positive control of the

DOING IT
the
EASY WAY





flowing oil, he fixed a switch at the hose nozzle and taped his wiring down the hose to the pump. Thereafter one man did the job in fifteen minutes flat, where it had taken two men exactly twice that long before. The final result was that the company saved \$821.25 a year in wages alone on that job.

That sort of thing happens almost every

day at shops of the line in Glendale, Calif. Also in the hangars of TWA, United Air Lines and Western Air Express at Burbank, near by.

James V. King, superintendent of maintenance for WAE, studied the \$4,000 catalogue price of a quick-change multi-frequency telegraph transmitter of 500-watt power and then declared, "My boys can



TWA
Top, mechanics swarming over plane. Bottom, a drum lifter, propane-gas heater used to warm cold motor quickly, and instrument man checking air-speed indicators with aid of "homemade" device.

TWA

*James King,
Head of shop*



Pushed
 "Push-pull rod," above, for avoiding tight corners in moving plane. Right, making inspection with flashlight and dental mirror. Below, leverage principle for removing tires



Another instance of how hangar brains solved a problem is found in the engine heater King's staff rigged up to save starting batteries and frozen fingers in severe winter weather. A homemade gadget, including an ordinary stovepipe and

elbow, it works so well that Pan American Airways now is using Jimmy's WAE specifications to build similar heaters for the Alaskan schedules. This outfit will raise the temperature of a motor with hot air from about zero to a point where these giant motors can be turned over by hand in about twenty minutes. The cost is only four cents an hour.

Another interesting invention is a constant manifold-pressure device for testing the automatic mixture control used by the big Douglas main liners. Still another is the apparatus devised to force a cleaning solution through the oil-radiator cleaner itself. Of equal interest is a manually operated speed control unit for the Link trainer which simulates actual flying conditions for pilots practicing blind flying on the ground under a hood.

Among the cleverest devices worked out by the mechanics are the three-step machines for reconditioning spark plugs.

(Continued to page 118A)

build one of these at a fraction of that price." And they did, from design to completion, at a cost of but \$250!

When Earl Kiernan, chief of the WAE radio department, needed a test device for adjusting the marker receiver, he built it at a cost of twenty-five dollars. The same apparatus was on the market for \$400.

Swiss Hornet Game Played with Ten-Foot Club



Wide World

Played at Emmementhal

Resembling a combination of baseball and golf, the Swiss hornet game is played with a ten-foot, flexible club and a puck that makes a buzzing noise like a hornet as it flies through the air. The player bats the puck toward a field set off with numbered markers. In the field are "catchers" with bats that resemble oversized shovels, with which they try to stop the puck in flight. Should they succeed, the batter is out. Otherwise, he scores a point. Top, left, setting the puck. Circle, swinging. Below, fielders trying to stop the puck. Bottom, left, keeping score



in Bernese District



Hand-Operated Dry Shaver

Lets You Shave in Car



Pump lever of dry shaver with fingers to operate cutters, guiding razor over face as shown in inset

You can shave in your car, on the subway or at your office desk with a non-electric dry shaver just put on the market in England. Similar in appearance and in action to the electric models made by the same firm, it is operated by working a lever back and forth with a slight finger pressure. It is finding use among commercial travelers, motorists and vacationers.

One-Man Pike Pole Like Jack Equals Force of Six Men

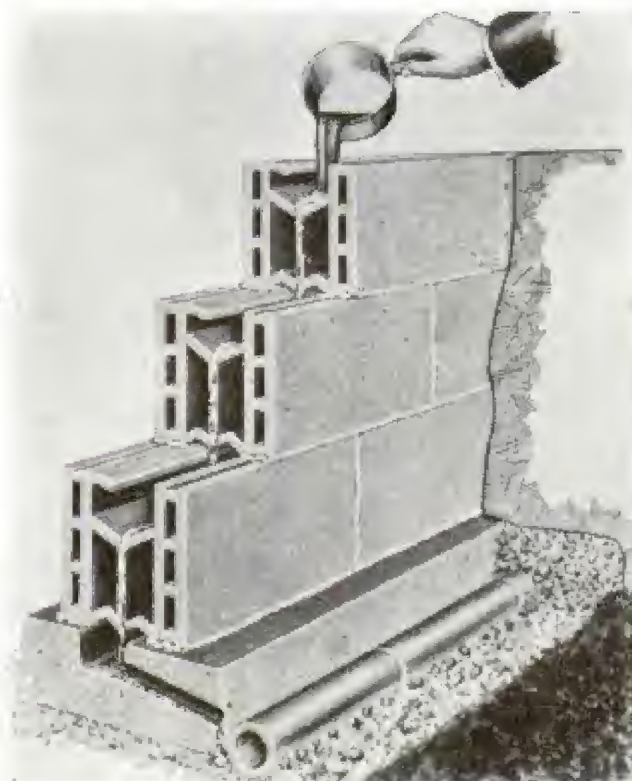
Many applications are found in industry for a telescopic power pole, similar to pike poles used in logging, except that this one



One man can straighten leaning post with telescoping pike pole that is worked similar to auto jack

can be extended like a jack. Telescoping one into the other, two pieces of heavy iron pipe are powered by an easy working ratchet-lever hoist, or load binder, extending them from eight feet and two inches to eleven feet and seven inches. One man can operate the tool in straightening a leaning telephone pole or a tree, righting overturned vehicles, pushing over walls in the demolition of old buildings or shoring up the sagging sides of a building. Ordinarily it is operated with a flat base at one end and a sharp point at the other, but for logging it is equipped with sharp points at both ends. It is especially useful in breaking up log jams on river drives since the pole may be pre-set and then operated by remote control to pry loose the "key log" that holds the jam.

Tile Has Built-In Drain System to Keep Basement Dry



Cut-away section of wall shows how water runs down tile step by step and finally flows into drain pipe

Basements are kept dry by tile with a built-in drainage feature consisting of channels to guide water from the top to the bottom of the foundation and into a drain pipe at the base. Easy to keep clean, the tiles are furnished glazed or unglazed, and it is claimed they will not shrink or crack or require repairs or painting.

National Fireproofing
Co., Euston Bldg

Safety Phone for Farmers at Rail Crossing

Telephones are installed at a dangerous railroad crossing in England for the safety of farmers who drive cattle or haul crops over the tracks. When a farmer desires to use the crossing he rings the signalman for an all-clear signal, and after completing his crossing he again calls to inform him that the track is clear and that the gates have been shut. Instructions for using the phone are printed on a board near by. The farmers are provided with keys to the gates which are kept locked.



Farmer calling dispatcher at signal-tower to learn if it's safe to drive cattle across tracks. Gates shut out cattle and unauthorized persons

Boat with Airplane Cockpit Navigates Shallow Water



Sixteen-foot speedboat supported by pontoons draws only two inches of water. Pilot's seat is like the open cockpit of an airplane

Christened "Voodoo," a powerful speedboat built recently for Chauncey Hamlin, Jr., a sportsman of Buffalo, N. Y., has an airplane-type cockpit for its pilot. The sixteen-foot boat is equipped with specially designed pontoons for support and draws only two inches of water. Its power plant is a 175-horsepower Lycoming engine.

Automatic Life Jacket Inflates Itself If Wearer Falls into the Water

Greater safety is the intent of a life jacket for participants in aquaplane and other water sports. When the wearer falls into the water, the jacket inflates automatically and keeps the wearer afloat indefinitely. The jacket was tried out recently by entrants in an aquaplane race from Catalina Island to the California coast.



Life jacket resembles a bolero when deflated. It is intended to provide greater safety for participants in water sports

c/o Aquaplane Assn.
Hunting Beach, Calif.

Designed by Helen Miller
20 Cleveland Ave.

Trap for Vacuum Cleaner Catches Usable Scraps



Heavy particles entering vacuum cleaner are caught in trap, later being unloaded free from dust and dirt

To salvage screws, nuts, bolts and other usable material in shops from dust and dirt picked up by vacuum cleaners, a special receptacle has been designed for attachment to cleaners and blowers. This serves as a trap, catching all heavy particles, which can be removed easily for inspection. Also, metal objects cannot reach the fan and cause damage.

Artistic Design in Every Photo Assured by Scene Viewer



Photographers can check the artistic qualities of a picture before it is taken, by using a viewing meter that guides the position of the principal and secondary subjects of interest. Patented designs are engraved

on two separate translucent plates contained in a leather case. First you adjust the meter so you view through it the picture area to be covered by the camera. You then arrange your position or the position of the objects so the principal and secondary subjects of interest are located at points designated by small circles on the meter. The result will be a balanced picture. The meter also serves as a monotone filter to help judge the lighting of pictures taken on black and white film.

Crib Serves as Dressing Table When Spring Is Raised

Greater convenience in caring for the baby is offered mothers by a crib equipped with special brackets that permit raising and lowering the spring. With the side down and spring in upper position, the crib may be used as a dressing table. Being at the same height it can be set alongside the mother's bed enabling her to care for the child without arising.



Top, with spring lowered, crib is safe place to sleep or play. Below, raised, may be used as table

Visit: Chicago Baby Carsey Co. 1801 S. Michigan

Lumina Photo Utilities, Inc. - Kroll Bros. Co. 1801 S. Michigan

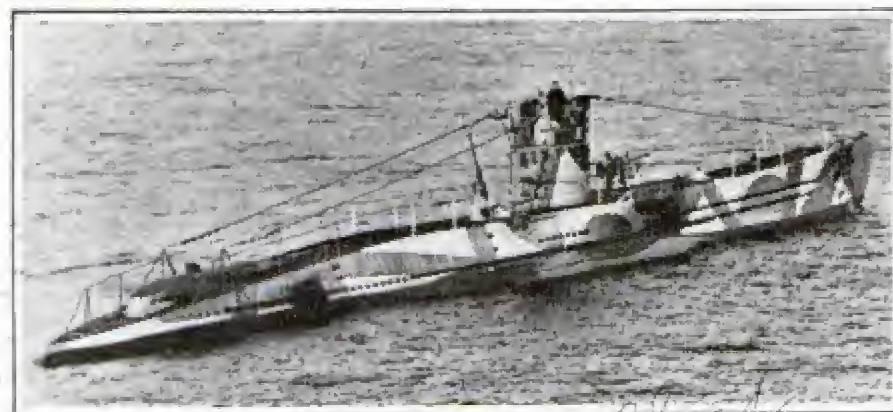
"Offset" Tractor Allows a Clear View of Row

Two lightweight tractors built for the small farm and for utility jobs around the big farm have just appeared on the market. One, built by Ford, has hydraulic controls which permit automatically controlling the implement to any desired depth in the ground regardless of surface irregularities. Tractor and unit implement are so closely coupled that they can work in corners and small irregular plots too small for horses. Tractor and tools are combined in one unit; for row crop cultivation, the cultivator can be attached in a few seconds without tools. The new International Harvester company tractor has an "offset" seat on the right, the motor being mounted forward at the left, so that the farmer has always a clear view of the row as he cultivates. In contrast with early tractors made by the same company, it weighs about 1,700 pounds, less than the weight of the flywheel of old-time implements.



Top, tractor with "offset" seat made by International Harvester; and, below, Ford tractor has hydraulic controls for close-coupled implement

Camouflage Guards Submarines by Matching Sea Colors



Difficult for enemy ships to see is this German submarine painted in war-time camouflage to blend its bulk with colors of surrounding waves

During maneuvers of Germany's fleet in the Baltic sea, the defensive value of camouflage for submarines was demonstrated. When viewed at a distance, craft painted in these odd designs easily blend into the gray-green of surrounding water. Even if spotted by an enemy ship or plane, they would provide a most difficult target.

Electric Dry-Mist Sterilizer

Purifies, Deodorizes Air



Dry mist from electric sterilizer floats in air, killing odors and bacteria, without leaving trace

An electric sterilizer intended for purifying and deodorizing the air of the home, sickroom or hospital room emits a bactericidal mist so fine and dry that it will not even fog a pane of glass. The unit, using house current, pulverizes liquid into super-fine particles that float in the air indefinitely without dampening effects. A cabinet model can be used to disinfect clothing, utensils and other articles, accomplishing its purpose within a few minutes. Loaded with an insecticide, it emits a fog that drives out pests and vermin without leaving perceptible odor or oil film.

Discovery of Fifth Skin Pigment Helps Diagnose Disease

Added to the hitherto known four skin pigments is "melanoid," recently discovered by use of a new optical instrument—the recording spectrophotometer—which makes possible speedy and precise analysis of skin colors.

Study of the many factors underlying variations in the color of human skin is enabling doctors to diagnose anemia more effectively than formerly and to watch closely the progress of their attempts to cure a patient. Melanoid is a diffuse form of melanin, a long-known skin pigment, and an abundance of these two results in a dark skin, whereas a lack of them gives a light skin. A third pigment, carotene, which is responsible for the hue in carrots, has never previously been recognized as a color component of the human skin. The other two pigments, producing a pinkish flesh tint, are the two forms of hemoglobin found in the blood, oxy-hemoglobin, and reduced or oxygen-free hemoglobin. All peoples, research has revealed, have these five color pigments.

Transparent Mailbox of Glass Is Emptied by Bottom Door

Visible from all sides, the contents of a glass mailbox can be seen by the householder without going outside. For convenience in inserting and removing letters, the box has openings at the top and bottom. A large spring clip above holds newspapers.



You can see from indoors whether there are letters in glass mailbox. Both cover and base are hinged

Mr. E. A. Edwards, Harvard Medical School, Cambridge, Mass.

Whirligig Traps and Measures Lightning Bolt



Left, lightning arrester that discharged lightning stroke captured by fifty-foot mast, center. Right, compass checks presence of magnetism in fulchronograph wheel



High atop the forty-two-story University of Pittsburgh Cathedral of Learning scientists set a trap for lightning, captured a bolt and metered its current and its fleeting life span. It was the first time natural lightning had been so analyzed. The whirligig magnetic surge recorder, called a fulchronograph because it measures both current and time, registered a lightning stroke lasting one-sixtieth of a second with a maximum crest of 21,000 amperes, while a newly developed lightning arrester no larger than a quart jar discharged the burden of the bolt without damage. Purpose of the experiments is to find means of protecting transmission lines from lightning. A fifty-foot steel mast on top of the 535-foot building is used to attract lightning. The fulchronograph is a motor and slotted aluminum wheel filled with magnetic steel fins that project from each side, rotating through two coils that carry the surge from the lightning bolt being measured. Current in the coils produces a magnetic field

proportional to the surge current at any instant, and the fin on the recording wheel which is passing in the field is magnetized according to the current carried by the stroke in time divisions as brief as forty millionths of a second.

Easy-to-Read Marine Compass



With its balanced, full floating dial in vertical position for convenience in reading, a liquid-type compass is designed for motorboats, sailboats and other small craft. Housed in a streamline brass case, the instrument fastens to any level surface.

Hull Mfg. Co.
Box 246, Warren, Pa.



DON'T

Left, watching Maximo on wire may reveal secrets of balance. Below, this way of falling on stairs may result in arm fracture. Above, right, how to roll without injury



AS LONG as you're going to fall, you may as well learn to do it properly so you won't break your neck.

There's no better place to study the technique of taking a tumble than at the circus. Next time you go, pay particular attention to the aerialists, wire-walkers, balancers, and clowns, and you'll pick up a few pointers that may save broken bones later.

Decorating the Christmas tree, hanging Junior's picture, or cleaning pantry shelves may not seem like very dangerous pursuits but last year 26,700 persons met their death while engaged in just such tasks. And an analysis of the 4,750,000 non-fatalities in homes shows a high percentage of them to be the result of persons tripping over loose rugs, doing nose-dives down the cellar steps, and stepping on the soap.

Likewise in industry, falls constitute the greatest work hazard and if it weren't for those who tumble out of haymows and off machinery, the mounting total of accidental deaths in agriculture could be drastically cut.

Cont. James the Dineeny
431 W. 60th Street
Kansas City, Mo

2419?

TAKE IT SO HARD



The proportionate number of deaths resulting from trapeze falls can't be compared with the number caused by collapsed stepladders; the bathtub looks like a deathtrap alongside the perch poles the circus daredevils use when the relative fatalities of the two are studied. The reason for this is simple. The performer knows what he's about whereas the picture hanger or bather doesn't. The former has schooled himself in the technique of the fall and knows how to make his body protect itself in an emergency.

Consider the clowns. You've seen Otto Griebeling start to break into a run, get tangled up in his floppy shoes and go sprawling on his face. His movements seem identical with those of the householder tripping over the handle of his son's wagon, only Griebeling doesn't suffer a wrist fracture or get his face scratched up as the latter is likely to do. How does a clown manage to escape injury? For one thing, he turns his head to either side and instead of going down with his full weight on his wrists he bends them slightly the instant he touches the ground so as to absorb the shock.



Top, left, picture hanger falls because she failed to test strength of the chair. Right, if you lose your balance on rail, turn fall into a swing (as illustrated below)

When the average person's heel slips on a banana peel or small rug on a highly polished floor, his legs shoot out from under him and he falls backwards after frantically flailing his arms in an effort to regain his equilibrium. His hospital chart is likely to mention something about a double



wrist fracture, a dislocated hip, or a brain concussion. In case you ever find yourself on the verge of taking off from a banana peel, Frank Conville, comedian, prescribes a safe way of handling yourself: "Pull back the leg taking the step and instead of forcing your body backward by clutching at thin air, jerk it forward, bend your knees and drop into a crouching position." It's axiomatic with performers, he says, to "go with the fall."

"Gravitation's impossible to beat," he explains, "so you've got to get around it as much as possible. The best way of doing this is to go with the fall, not fight against it. When you scramble wildly after losing your balance you are going against the fall, thus adding to the momentum. Remember—'go with the fall' and you're not likely to be injured."

When it comes to skidding on an ice-coated sidewalk, don't go down in a heap with all the weight on your wrists but

quickly tuck in your chin, draw in your breath so as to prepare your body for the jolt, and as you go down try to make a turn so the points of contact are your hip pad and the protected part of your shoulder. What is true of the slip also applies to the stumble. Instead of scrambling all over the place, flex your knee quickly and you'll find yourself in a position similar to that of a football player's on the line of scrimmage.

There's a sermon for the picture hanger as well as the person with a flair for falling in or out of the bathtub in the pulsating feats of the perch artist. Before he ever attempts any one-arm balances at some dangerous height, he is certain his equipment will sustain him, checking it carefully before every performance. That's not true



Top, bend wrists at moment of contact to ease shock and you'll avoid such injuries as are almost certain to result from putting out your arms (below). If you start to fall backward, put chin close to chest and make arch of your back (bottom)

of the usual person who, rather than make a trip out to the garage after a stepladder, will blithely hop up on a chair, box, or bookcase without ever pausing to measure its strength. Naturally, the hand balancer cannot afford to be careless about his work.



A false move may kill or maim him. He makes it a rule not to let go of his handholds until he's properly balanced. If a bather would hold onto the towel rack and the side of the tub until he was sure of his footing, his spine would never be endangered.

Every chair tipper goes too far occasionally and finds himself on the floor, sometimes with bruises and fractures. The way to preclude such upsets, according to Arzeno Selden who does his chair tipping ninety feet off the ground, is to project your body forward the instant you feel your balance slipping away. Instead of shooting out your legs, pull them back with all your might. The chair may topple but you won't as you'll be in a position midway between a crouch and an upright stance.

If you can't keep your basement stairs well lighted or free of toys, brooms, and scrub buckets, a few general tips on how to fall down them without having to be rushed

(Continued to page 137A)



Two photos and drawing show how acrobats learn to regulate the speed of their turns in the air. This timing sense precludes many falls

Doll with Coiled Wire Legs Can Stand on One Foot

can't locate 4/2/48



High-kicking doll stands on one foot and holds other in its hand. Flexible legs and arms do the trick

Able to sit, stand and even hold one foot in the air, a doll now on the market is unbreakable. "Baby Snooks," as it is called, has arms and legs of hollow wire cable that may be bent into any desired form.

Flameless Electric Paint Burner Removes Surface Quickly

Before painting or decorating, the old surface—whether it is paint, varnish, putty, wallpaper or linoleum—can be removed



Scraper removes old paint with ease after it has been scorched by flameless electric burner

quickly and safely with a flameless electric burner just introduced. Operated like a flatiron, its aluminum surface heats rapidly and softens the old paint without harming material beneath. While one hand operates the burner, the other scrapes away the loosened paint. When removing linoleum or wallpaper, the surface is first moistened so that steam is generated.

Safety Flap over Paper Spindle Guards Hands from Injury

Old-fashioned spindles with their dangerous points sticking upward have been rendered harmless to hands and clothing by adding a flap to cover the tip. This safety top is hinged on a separate standard attached to the base, and it lifts up easily by inserting under it the paper to be placed on the stick-file.



Lamp on Memo Pad Is Lighted When You Pick Up Pencil



Pick up the pencil from this memo pad and you also automatically turn on electric lamp at top

When the pencil is picked up from its slot in the base of a memorandum pad, a small lamp is automatically turned on to flood the writing surface with light. The set uses house current and is handy for the telephone stand or bedside table.

*A. Stanley Brussel,
225 7th Ave. N.Y.C.*

*Box M. L. Agnew, Inc.,
3 Howard St. Auburn, N.Y.*

Shadow Lingers Behind on Tricky Screen

Walking away from your shadow may seem impossible, but that is just what a man of the General Electric company does, using a special screen. He first sits in front of the curtain, then gets up and walks away while his shadow remains sitting. The process is simple. The screen on which the shadow is cast is made of phosphorescent material that stores up light from a powerful spotlight. Only portions "charged" with light will glow, so when the house lights are turned off the screen continues glowing except the part which received no light because of the shadow. By turning on and off the red light of neon lamps, the shadow can be wiped out and brought back again. This is



Shaking hands with own shadow that "froze" on phosphorescent screen. Part that received light remains luminous leaving shaded portion dark

because the red light does not "charge" the screen, and the phosphorescent light cannot be seen under the neon lamps.

Roller Coaster Model That Runs Built by High-School Boy



Builder adjusting chain that lifts cars to top of miniature roller coaster

Patience and painstaking work of an eastern high-school boy resulted in the completion of a miniature roller coaster like those used at amusement parks. The year and a half required in its building included many hours of study and experiment to be sure that the cars would not leave the rails on the banked turns and sharp dips of its sixty-five foot course. To start them on their mad dash cars are pulled to the top of the ride by a chain.

⌚ Glass curbs installed on English highways are said to offer better visibility at night and in fog than curbs painted white.

*conv. Robert Weisil
East End Park Pa*

*Public Safety
Aug 1939*

*Reference: Robert W. Barton Chief Maritime Insurance
 Information Section U. S. T. Washington
 226*
 28
 105 35
 Los Angeles, Calif.

«DISASTER COLLEGE»



GATHERED in the wardroom of the ex-Coast Guard cutter "Northland," a group of sea captains and mates are taking an examination.

"Suppose," says Lieut. E. E. Hahn, Jr., "that you are first officer on a large passenger ship. Your captain died last night and now you are in command. Your ship is a modern luxury liner, one of the most fire-proof afloat, and you have a full passenger list. Tonight a small fire breaks out. What are you going to do?"

Details of this problem don't seem alarming but they were the circumstances under which fire swept through the "Morro Castle" and caused one of the great marine disasters of recent history.



Spherical blackboard on which problems are demonstrated (top) and students receiving Diesel repair instruction (bottom)

for SEA CAPTAINS

"Suppose," asks Lieut. Hahn, "that you are weathering a heavy storm. One of the crew reports considerable water in the hold and more leaking in through the coal ports. What do you decide to do?" Again the question is a simple one but the wrong decision could cause another disaster like that of the "Vestris," from which tragedy the details of the question were taken.

Making the sea safer by



Right, top, boatload of students being lowered. Bottom, large slide rule used in the nautical classroom



Top, engineering students at work. Circle, "marlinspike seamanship" being taught seaman. Right, instruction in use of signal flags. Bottom, ready to go over the side in boat

"taking shipwrecks apart" and studying the things that could have been done to prevent them is one of the subjects taught at the Maritime Service Training Station of the United States Maritime Commission at Government Island, Alameda, Calif.

Every shipwreck has a lesson in it, and at the school the officer students study each of the outstanding marine tragedies of the last several centuries. The "Vestris" and the "Eastland" sinkings might have been prevented if their officers had understood the proper loading and balancing of their ships. In the cases of the "Morro Castle"

and the "Titanic," lack of disciplined drill and organization helped contribute to the disasters. Sometimes captains hesitate to send an SOS until the last possible moment, delaying rescue work. Regular radio watches and the international ice patrol were begun as a result of the "Titanic" sinking. More recently, stricter discipline

6- June 1942-39
re

and more frequent, thorough fire and boat drills have resulted from the "Morro Castle" fire.

Only men who have already been to sea can enroll in the schools of the Maritime Service. Young officers intent on rising to the top and grizzled sea dogs who have walked the bridge for a score of years sit side by side before the instructors. Often, in "disaster class," men who were present at the wrecks being discussed relate their experiences. Understanding of the causes of a disaster sharpens their interest in such subjects as cargo stowing and the distribution of weights.

The new training schools were established to increase the efficiency and skill of seagoing men and to help them advance in rank, as part of the program to return America to its former status among the leading maritime nations.

Officers who have plenty of practical experience but who do things by rule-of-thumb are taught theory and background in class. Only those who have served at sea seven months or more during the last two years on American ships of 500 gross tons or more and who are now unemployed can attend. During the three months of the course the students are provided with food, quarters, clothes, and are paid from \$36 to \$125 per month, depending on their rank. The men are allowed to return to school one month per year for more instruction.

At Government Island both the student officers and the unlicensed seamen students get plenty of classroom paper work, yet all hands turn out for the frequent and intensive drills in all kinds of emergency work. At the station you are apt to see the rare spectacle of a boat's crew of sea captains clambering into a lifeboat and getting it away smartly from the ship's side. No matter whether it is an abandon ship drill, a fire drill, use of the breeches buoy, or a drill in damage control, the idea is to do away with all confusion and to perform the drill with no conversation and a minimum of orders.

The Maritime Service is using Hoffman and Swinburne islands in lower New York Bay and the Coast Guard base at Fort Trumbull, New London, Conn., as its colleges on the Atlantic. On the Pacific its Government Island training center is in an

(Continued to page 116A)

Portrait on Stainless Steel Has Mirrorlike Depth



Portrait on circular piece of stainless steel has third dimension and will last longer than canvas

Mirrorlike depth of portraits and greater permanence than is possible with canvas are claimed for paintings made on stainless steel. The polished alloy background gives the third dimensional effect and will not crack nor rot. Metallurgists say such portraits will last at least 1,000 years.

Folding Cot for Beach or Camp Carried Like Suitcase

For lounging in the back yard, outings on the beach, and camping in tent or trailer there is a folding cot that packs in a suitcase. The duck cot is easily set up, and is available with steel-tube or hardwood frame. It weighs about fifteen pounds.



Top, cot holds grown person when unfolded, and fits in suitcase for carrying, as shown in circle

Baby's Crib Is Also Cabinet, Bath and Dressing Table

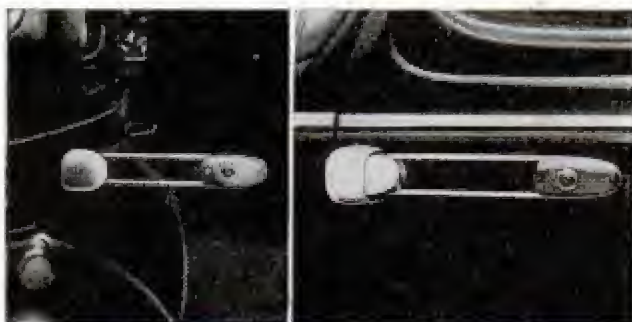


Mother saves many steps with baby's clothes handy in crib that combines bath, table and wardrobe

One piece of furniture that serves four purposes in the nursery is being introduced this year. It is a combination crib, baby's bath, wardrobe and dressing table. There are two large and two medium drawers in front, and a wardrobe section in the side for the baby's dresses.

Safety Auto Signal Flashes Light to Indicate Turns

Mounted on the auto door next to the driver, a signal arm has a built-in light to attract attention of other motorists. To swing out the arm to signaling position a



Left, auto turn signal extended gives light to rear of car, and, right, then folds back snugly on door

small knob inside the car is pulled; the bulb automatically flashes twice and then burns steadily while the signal remains extended. For installations small holes are drilled in the flange of the left front door and a simple electrical connection is made.

Hundred Million Billion Suns in Range of Telescopes

It is conservatively estimated that there are not less than one hundred million billion suns among the groups of stars that are within the range of present telescopes, according to Dr. R. S. Underwood, of Texas Technological College. Written as a number, this is the figure "one" followed by seventeen ciphers. This amounts to so many suns that, if they were reduced individually to the size of buckshot, they would fill a line of trucks strung end to end from Boston to San Francisco and folding back on itself about two hundred times, Dr. Underwood declared.

Metal Cleats Space Roof Nails at Uniform Intervals



Roll roofing is held down firmly along entire edge by "endless" cleat with nail every inch-and-half

Metal cleats with nail holes one and one-half inches apart make it possible to space the nails evenly when applying roll roofing, and to fasten the roofing down continuously along the full length of the seam or edge instead of merely under the nail heads. The cleats are thirty inches long and can be overlapped with one nail through the end holes of the adjoining cleats.

Mallory Electric & Fuller Co. and Cloverdale St. New York City

Streamliner's 'Earlaps' Blow the Smoke Away

Grotesquely unlike American streamliners, the newest locomotive of the State Railways of Germany has projecting fins like ear flaps to divert the smoke from its stack upward and away from the train. The engine has a top speed of 115 miles an hour and a cruising average of 100 miles an hour.

Camera and Compass Show Slant of Well

By lowering into the oil well a tiny camera, a calibrated scale and a magnetic compass, drillers now have a way of finding accurately the alinement of their wells far underground. The compass at all times indicates a fixed direction magnetic north, while the angle of the scale varies in accordance with the direction of the drill hole. The relative positions at known depths, as recorded by the camera, tell the experts exactly how the drill hole slants. The equipment is designed particularly for oil wells purposely drilled off the vertical to tap offshore pools on the California coast.



Smoke from streamliner is started upward and away from train by upturned fins that are worn on roof like a pair of earlaps

Meter for Artificial Respiration Shows Efficiency of Effort

As an aid in the training of rescue workers, a recording meter has been developed that gives a constant, visible check on the

efficiency of artificial respiration. While the resuscitation work goes on the graph shows the pounds of pressure applied by the operator at each stroke, and, on the opposite side of the chart, the volume of air expelled in cubic centimeters. A timing mechanism indicates the number of strokes and breaths per minute.



Meter records stroke pressure, volume of air expelled, and rhythm of breathing, to help train students of artificial respiration methods

One strand of grass that grew forty-eight feet long, sending down new roots every few inches from which blades shot up three feet high, was found in East Africa.

mine safety appliances Co.
Braddock, Thomas and Mead.

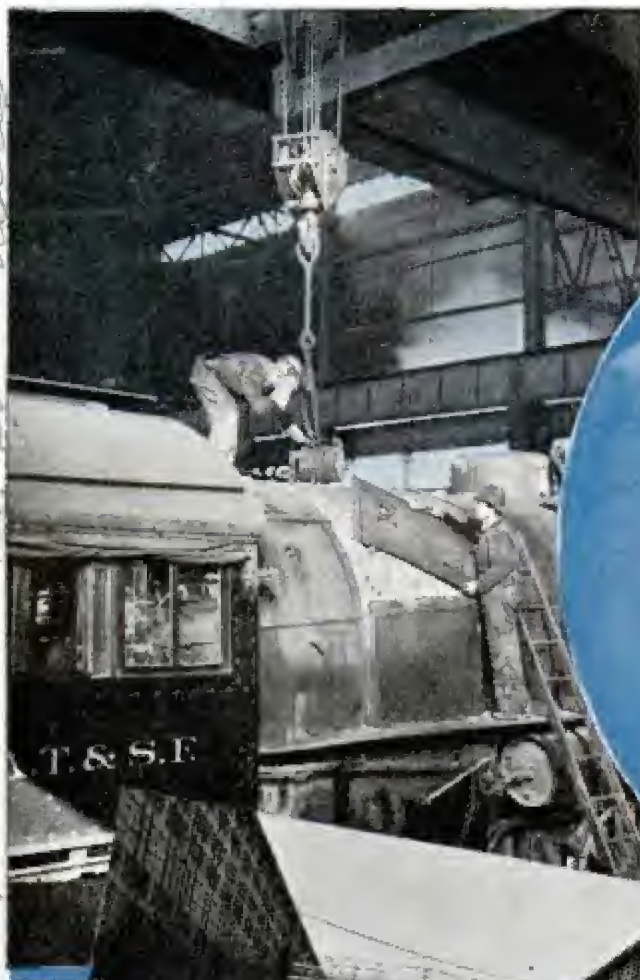
Tribune. 7/10/39

Q 678.

Mr. Thomas G. Lumsden Jr.
10555 Holman Ave
Los Angeles

Conk & Co. Ryder, Santa Fe Rings
560 S. Main St. Los Angeles

"HOSPITAL"



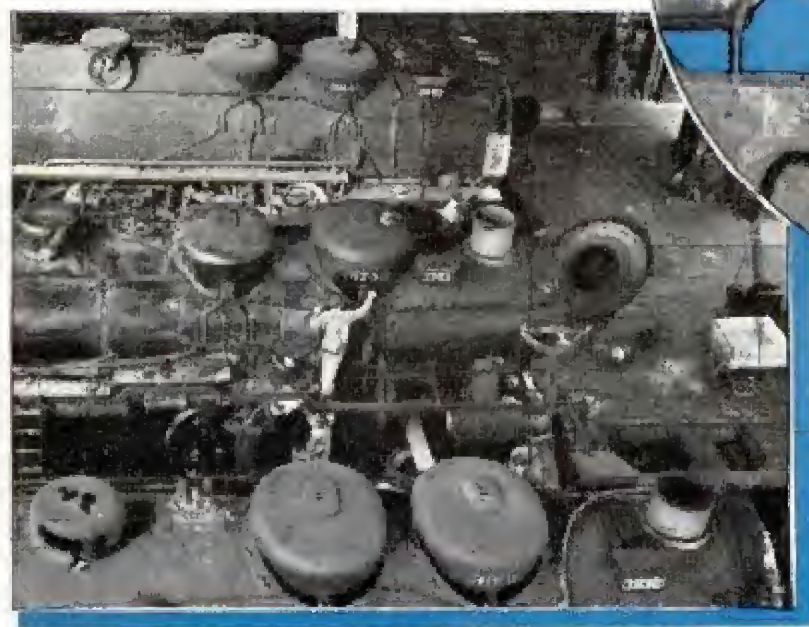
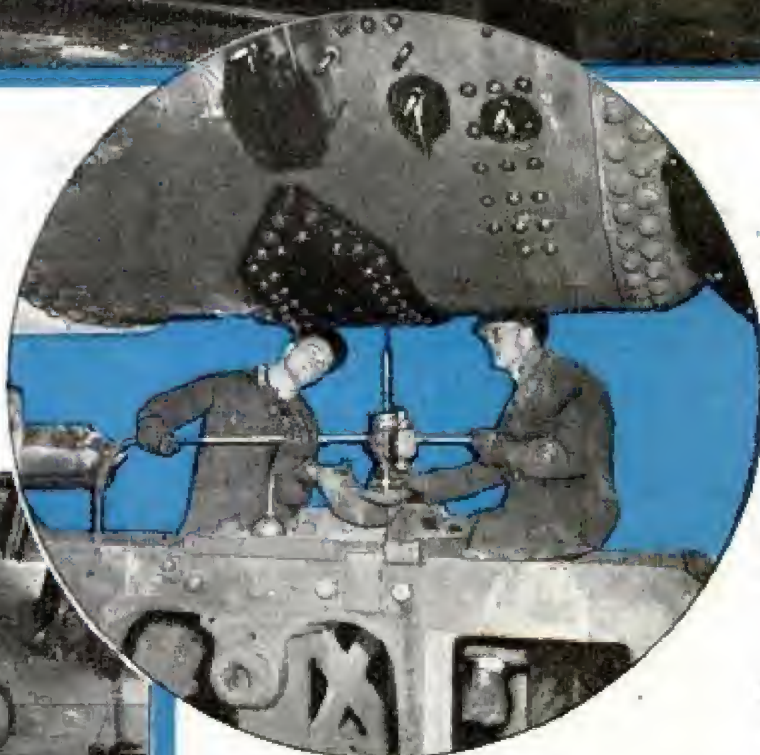
Keeping big locomotives at peak efficiency requires the services of an army of trained artisans, ranging from bricklayers to operators of specially designed lathes. Still hot from a run, the monster engine goes to the "hospital," or repair shops, for a light overhauling calling for about 3,500 man-hours of work. Above, new crown sheet being applied. Top, left, removing jacket and insulation. Center, transfer table hauls locomotive to stripping shop. Bottom, left, general view of hospital. Right, preparing to repack casing



for LOCOMOTIVES



Whether the locomotive needs repairs or not, it has a general overhauling at the end of each year of service and at four-year intervals it is rebuilt from the tracks up. As a result a locomotive has a useful life of at least twenty years and some of the Santa Fe's engines have been operating steadily for thirty-five years. Above, stripping-down locomotive on the erecting floor



Light overhaul consists of removing 1,500-pound driving tires from wheels and turning down flat spots in lathe, grinding valves, replacing gauges and testing and adjusting every moving part. Circle, reinforcing boiler—drilling holes for "wind sheet tee iron" studs. Left, view from above as erecting floor workers assemble locomotive. Soon the "patient" will be roaring along the rails, hauling a dozen or more loaded passenger cars at speeds above sixty miles per hour

Tweed and Leather Pianos Set New Styles for Home



Piano sporting covering of blond oak and tweed is one of designs to match furniture in modern home

You'd hardly recognize the old piano in its smart new dress. Breaking away from the traditional styling of grands and uprights in mahogany and walnut and other standard finishes, it is appearing this year in shapes that conform with modern home furniture, in "blond" woods and with coverings of leather and tweeds.

Reel Warns When Fish Bites by Flashing Tiny Light

For the night angler, a device built into a fishing reel automatically signals when a fish bites by flashing a small light. The



Small light at right flashes when there is a tug on the fishing line

tiny lamp also illuminates the reel spool to facilitate untangling of the line. The device consists of a small housing for midget battery built on the rear of the reel and an elbow which holds a light bulb directly behind the spool and to the handle side. A switch on the front plate of the reel makes it possible for the angler to illuminate his reel spool when desired, throws on the flasher for bait fishing or breaks the circuit entirely. The flasher is synchronized with the reel spool, flashing twice to one revolution of the crank.

Movie Test for Drunken Driver Eliminates Court Trials

There are fewer police court trials of motorists charged with driving while intoxicated since the police at Fresno, Calif.,



Intoxicated driver who can't walk the line is ready to admit guilt when confronted with movie of failure

began making film tests of drivers arrested. The motorist is asked to walk a straight white line while the movie camera films his performance. Of the first 100 drivers tested in this manner, eighty-six entered guilty pleas immediately, three were dismissed when the film showed they walked the line without stepping off, and the rest were held for trial.

Giant 280-Ton Lathe Turns 120-Ton Castings

For machining and turning heavy castings or forgings weighing up to 120 tons, a giant lathe produced in Germany weighs 280 tons. Its centers are high enough to handle a casting nearly twelve feet in diameter if needed, and the distance between centers is twenty-six and one-half feet. Two large tool holders or carriages on opposite sides make it possible to take two cuts at one time; these can consist of the rough and finish cut, or both may be finish cuts of different diameters.

Photo shows giant lathe undergoing tests at factory. Having centers more than seventy-eight inches high, machine handles castings close to twelve feet in diameter and weighing 120 tons. Two cutting tools work at one time



One-Man Fire Department Is Mounted on Small Trailer

To afford protection against fire for rural points where there are no water



Complete with engine, pump, hose and axes, this trailer is an efficient one-man fire department

mains, a self-contained fire pump trailer is equipped with a ball-and-socket hitch that can be attached quickly to almost any passenger car. Having a low center of gravity and being well balanced, it may be towed at high speed on the road. Once at the fire, one man can maneuver the trailer into pumping position by hand, unreel the hose and start the pump. A four-cylinder engine pumps 150 gallons of water per minute at 100 pounds pressure, and it will deliver two streams at once if desired. Dirty water from ditches or creeks will not damage the mechanism. Included in the equipment are fire axes, extra nozzles, and a 500-foot reel of one and one-half inch, rubber-lined, cotton-covered hose in fifty-foot lengths. The engine is capable of fighting a fire 1,000 feet from the water supply if extra hose is available.

Within range of today's telescopes there are 100 million billion suns.

La. Power Co. Inc. Scientific Monthly
Chicago, Ill. Aug 19 39

Every POLICEMAN



Top, planning a raid with models on magnetic blackboard at Bureau of Investigation's training school. Center, "rogues' den" where police students learn to gather clues in robbers' hideout. Bottom, Newark patrolmen practicing with submachine guns

IT WAS murder, the district attorney said.

What would you say? The dead man was slumped across the bed with a bullet hole in his head. There were no powder marks around the wound, no weapon in the room, no eyewitnesses. What else could you call it but murder?

Yet you'd be wrong.

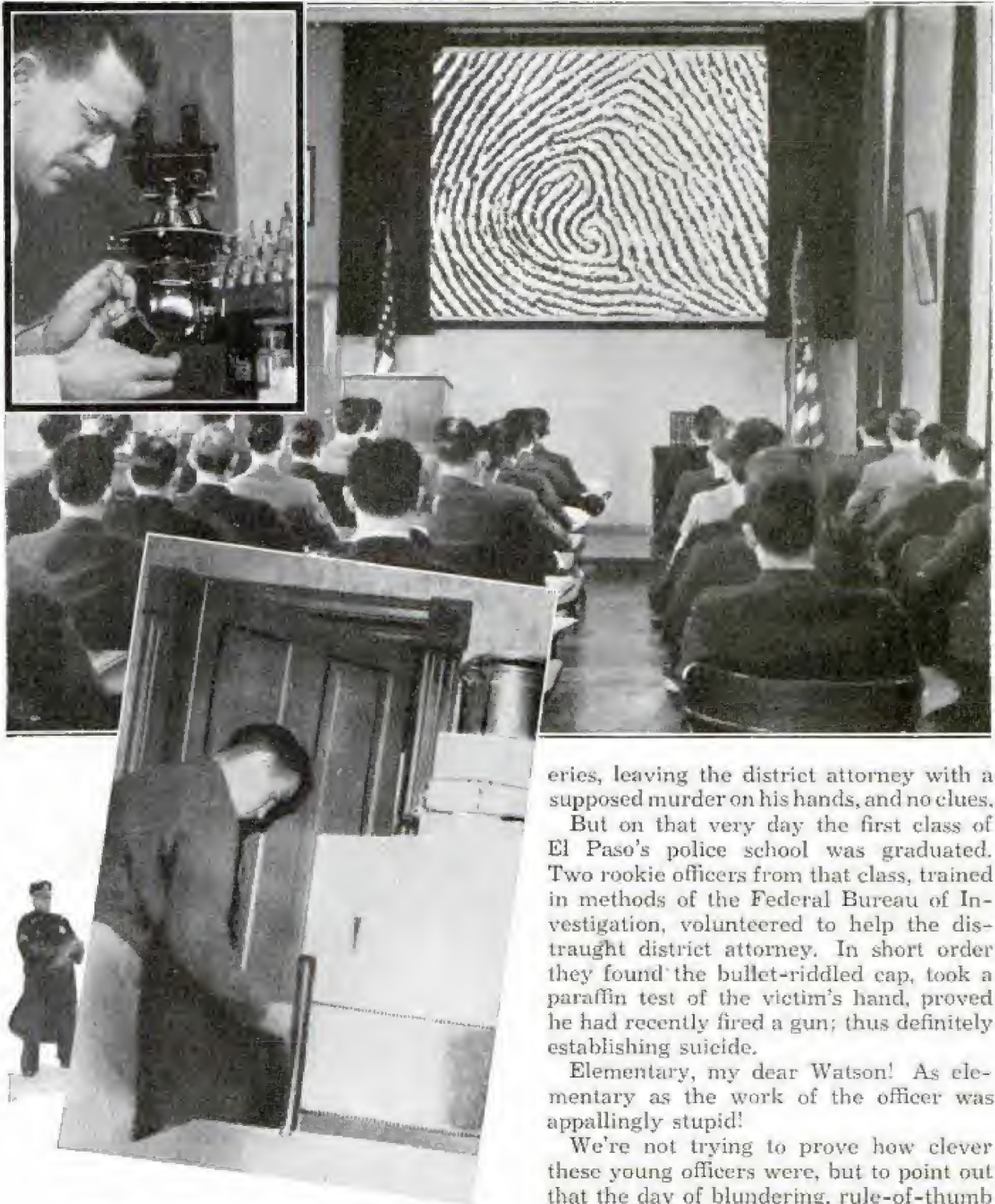
For the investigator was a policeman of the old school, which often means no school at all. First on the scene, he picked up the fatal pistol, thrust it in his pocket. The cap, which the victim had pulled low over his head, and through which the fatal bullet had been fired, the policeman snatched off and threw carelessly behind the bed, then returned to the police station without informing anyone of his discov-

*2561 - Cont. 1 Herbert O. Webb
april 3, 1938, Birmingham Apts
4822 2nd Road North
Arlington Va*

National Police Academy, Bureau of Investigation, Washington, D.C.

Newark Police and Fire Academy Bldg.

a "G-MAN"



Class at "G-men's" school attends lecture on fingerprint identification, top. Inset, working with comparison microscope in crime laboratory. Below, burglar takes his own picture as synchro-flash camera set by police is "fired" when he rifles money cabinet

eries, leaving the district attorney with a supposed murder on his hands, and no clues.

But on that very day the first class of El Paso's police school was graduated. Two rookie officers from that class, trained in methods of the Federal Bureau of Investigation, volunteered to help the distraught district attorney. In short order they found the bullet-riddled cap, took a paraffin test of the victim's hand, proved he had recently fired a gun; thus definitely establishing suicide.

Elementary, my dear Watson! As elementary as the work of the officer was appallingly stupid!

We're not trying to prove how clever these young officers were, but to point out that the day of blundering, rule-of-thumb crime investigation is passing. J. Edgar Hoover's boys have taught us that it takes more than brawn and a badge to make a police officer. They've shown that training

Capt. John Taylor
Holl Wayne, Jr.



shall return to their respective police organizations and impart the training they have received to their fellow officers. This small nucleus of graduates has already made instruction available to 76,668 policemen—which brings the goal well within sight.

Consider, for instance, what Captain Hubert E. Dax has already done with the Milwaukee police department. Graduating from the Academy in 1937, he has since then instructed



Student detectives examine "Oscar," the dummy, for clues to his murder, top. Center, pistol practice on marine corps range. Below tiny thread under microscope



is necessary. Now they are providing that training—training that will eventually make every policeman a "G-man," in efficiency, though not in name.

The Bureau of Investigation's National Police Academy at Washington is only four years old, has graduated only 334 police officers. At first glance this seems a puny start toward so ambitious a goal.

But the bureau is not merely training police officers; it is training teachers. The idea behind the Academy is that graduates

the entire force in scientific methods of crime investigation.

For example:

Three girls were injured in an automobile accident. The two boys who had picked them up at a dance hall were unknown to them. They disappeared after the crash.

The abandoned car was quickly identified as having been stolen. No identifiable fingerprints could be found on the car. The only clue was a hat that one of the young thieves had dropped, and it bore no markings. But inside the hatband was a carefully folded piece of paper, obviously placed there to obtain a better fit. It was part of the front page of an old newspaper, and a portion of the address label was still attached. On it appeared:

" owalski
" So 2d St."

Routine checking did the rest.

Or take the case of a patrolman who observed a man loitering on the main business street at 2:30 a.m. He had in his possession a rusty old railroad spike. The policeman arrested him on suspicion, then went back and examined the doorways on his beat. He found one where the glass pane had been broken near the lock. On the floor inside he found bits of broken glass, which he carefully collected. He returned to headquarters with

(Continued to page 114A)

Tractor-Drawn Sod "Shaver" Cuts Strips with Disks on Sled



Shaving blocks of sod from a field with the tractor-drawn "harvester," which strips sod at any desired width or depth

Sod "harvesting" is accomplished with a special sled-mounted knife at an Indiana nursery. Hauled by a tractor, the cutter literally peels strips of sod from the ground. Two sharp, upright disks determine the width of the strip and a flat blade "shaves" the sod at the desired depth.

Dual Bicycle Ambulance Is Economical on Short Hauls



Test run with the bicycle ambulance. Rider on right-hand bike is in control

Designed as an economical substitute for the motor ambulance for short-distance work, a dual cycle ambulance has been tested in England. It consists of a stretcher mounted between two bicycles and is propelled by two persons. The rider on the right-hand bike has control of the vehicle, the left-hand rider simply helping to pedal. Thus the rider at the left is free to render first aid to the patient. The stretcher is removable from the machine. One advantage of the bicycle ambulance is that it can be lifted over shell holes or other obstructions. It can be taken apart or re-assembled in a few minutes.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

One-Horsepower Safety Car Teaches Children to Drive

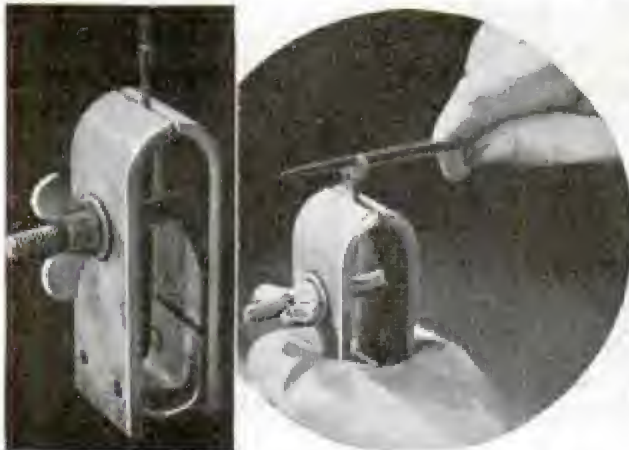


Safe driving practices are learned at early age with this English car driven by one-horsepower motor

Children in England are learning to drive an automobile almost as soon as they are able to walk. A miniature car that has all the controls of a full-sized automobile is on the market, and is called the "Junior Safety First Trainer" because it is used for schooling youngsters in safe driving methods at an early age. The one-horsepower motor drives it eight to ten miles an hour.

Simple Clamp for Small Work Has Viselike Grip

Objects too small to be held in the hand while being toolled are gripped firmly by a

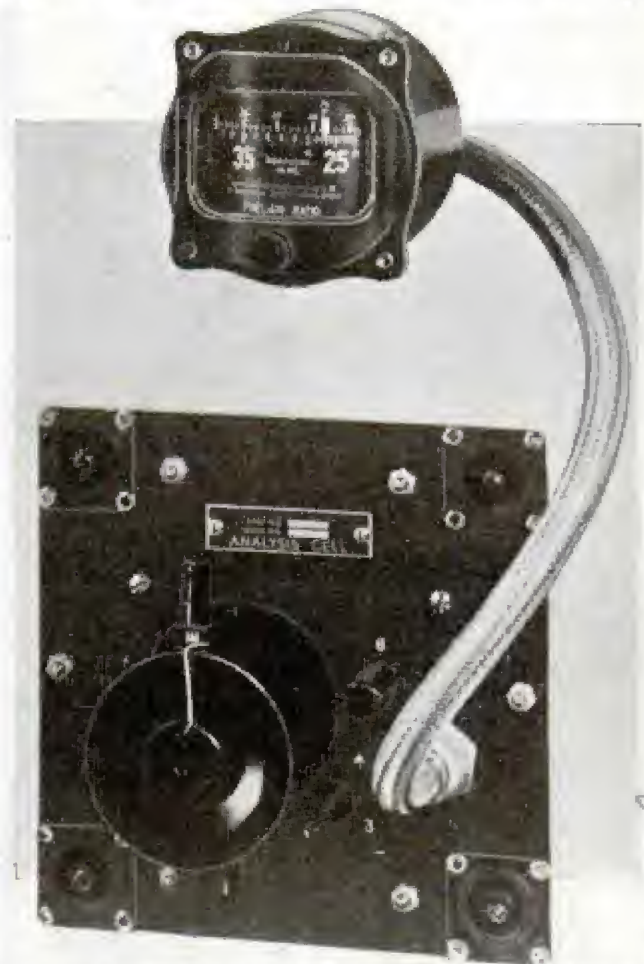


Hand vise holds piece in most convenient position

portable vise that is adjusted quickly by a thumbscrew. The clamp is particularly handy where it is desired to secure two or more pieces in a constant position while working on them. Its jaws are one and one-half inches wide and they open about five-eighths of an inch. The vise can be used standing on end or lying sidewise.

Fuel Analyzer Shows Plane Pilot If Mixture Is Balanced

Doing a job not done heretofore by any single instrument, a new fuel analyzer tells the airplane pilot at a glance whether his fuel mixture is too rich or too lean. High-speed planes rising from one altitude to



Indicator on instrument panel shows pilot whether fuel mixture is correct

another where there is less oxygen obviously require more air in their engines for efficient operation. An analysis cell continuously determines the fuel-air ratio of the mixture by analyzing the exhaust gas from the engine. The result of this analysis is shown on an indicator located on the plane's instrument panel, enabling the pilot to make proper carburetor adjustments.

Cambridge Instrument Co. 3732 Island

John C. Oetley
Belvidere, Ill.

Central Terminal
New York City

2900 *Wenger & Son's Corp.*
 POPULAR MECHANICS 727
Michigan City, Ind. (Hawley's Cabinet)
Complete Kitchen in One Unit Is All-Electric
50 or 60 cycles.

Everything needed for a complete kitchen is included in one unit that comprises a sink, electric stove, refrigerator, cabinet and cutlery drawer. An oven, too, may be installed if desired. When not in use the top is closed, concealing the fixtures and transforming the piece into a streamline sideboard. No door handles or knobs mar its appearance; doors and top are opened by pressing tabs. An electric lamp lights automatically when the top is raised and a concealed switch cuts off current to the burners when the top is closed.



Sink, stove, oven, refrigerator and cabinet for pots and pans all combined in one piece saves steps for housewife. Inset, unit when closed

2863
Diesel Train for Pikes Peak Cuts Down Running Time

Powered by three 160-horsepower Diesel engines, a new locomotive pushes a fifty-two passenger observation car up Pikes Peak in one-third less time than that required by equipment previously used. Operating costs for the train, the first of a fleet to be placed in service on this scenic cog railway, are said to be about one-half those of trains it replaces. In places, the railway scales twenty-five per cent grades

in reaching the summit, 14,109 feet above sea level. Besides a double cog, mechanical hand brakes, air brakes and a "dead-man" control, the new locomotive has a dynamic braking system. With this system, the electric traction motors that supply power to the cog through reduction gears while ascending the peak become generators during the descent. Resistance units absorb the electrical energy generated by the motors when the locomotive is on the downgrade, the speed being controlled by the number of coils brought into play. The fewer the units made available for absorption of electrical energy, the slower is the speed of the train.



Pikes Peak's new Diesel train pushing up one of the twenty-five per cent grades. Three 160-horsepower engines furnish the motive power

Manitou and Pikes Peak railroad

Diesel engine 160 hp. General

❏Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of a stamped, self-addressed envelope.

2.900. Cont André La Forge.
11 W. 42nd
nuyal



OBSTACLE RACE

Women drivers, teased by the men ever since cars were invented, are having the last laugh in Rome where the "automobile gymkana" is making experts of them. The gymkana consists of a maze of obstacles which would make even a New York taxi driver nervous. Negotiating such obstacles, it is claimed, teaches the cardinal rules of safe driving to participants. Top, driving over this teeter-totter helps the driver learn to keep control of the car under difficult conditions. Left, the shower-bath obstacle. If the driver strikes a hidden lever, the car gets a bath. Below, left, a quick stop was necessary as this traffic policeman was shunted in front of the driver. Below, right, picking up a plate of oranges and depositing them on another table requires accurate control of the car





TESTS *the* DRIVER

Each driver in the gymkana is accompanied by a woman companion who assists in accomplishing some of the stunts. Above, left, each occupant of the car is attempting to pick off a single balloon from a cluster hanging on each side of the track, without stopping or slowing down. This requires a deft touch on the part of the driver. Above, right, driving a zigzag course between rows of striped poles. Striking either a pole or one of the white stakes costs the driver a point



The stunt above requires an accurate eye. The driver stops her car, gets out and breaks an earthenware jar suspended from the cross piece. Then she must use care to avoid the broken pieces as she proceeds. Steady nerves are needed for the trick at the left. The driver stops her car and is given one try at putting the ball through the basket. Gymkanas, it is claimed, have improved the efficiency of Rome's women drivers thirty per cent during the past year

One Shaft and Club Heads Form Golfer's Outfit



Plenty of club heads but only one shaft—that's the latest outfit for the golfer

Intended as a substitute for the present heavy, cumbersome golf bag and clubs, a kit consisting of one shaft and a set of club heads is being introduced. The club head required for any shot may be attached quickly to the shaft by screwing it on. Contact of the club head with the ball does not loosen the head; instead, it serves to tighten the head because the golfer is hitting against the groove of the screw. The kit has slots on the side for five iron and two wood heads. A zipper device provides a compartment for the balls and small slots are convenient for carrying tees. The outfit weighs only about four pounds.

Vacuum Tube with Longest Life Lasts over Eleven Years

Longest-lived vacuum tube ever developed is the General Electric company's new mercury-vapor thyratron which will

serve, it is estimated, for nearly eleven and a half years continuously, night and day. Used to convert alternating into direct current, these tubes under test carry very high current, 175 amperes, and can be employed as commutators for direct-current motors such as in elevators and in experimental direct-current power transmission.

Phone List Slides into Base When Not in Use

One of the latest telephones has a number list built into its base. The list slides into the base when not in use. The phone is the automatic type and rings the number wanted when a switch on the base is set. It has provisions for ten call stations.



Foot Pump Inflates Auto Tire Quickly with Little Work

Requiring less time and labor for inflation of an automobile tire, a foot-operated pump is being offered to motorists. The cover of the pump is attached about its center to the plunger by means of a short rod. When the case is unlatched, a strong



Pumping up the automobile tire is easy with this new foot-operated pump

Science Service
7/29/30

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Developed by A.W. Drell.
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298
Cincinnati, Ohio

spring raises the hinged cover to an upright position, drawing back the plunger and preparing the unit for the pumping stroke. The hose is attached to pump and tire valve and the pumping is done by pushing the cover down with the foot as far as it will go and then releasing it. One hundred strokes inflate a 6.00x16 tire to thirty pounds pressure, compared to about 150 strokes of the ordinary hand pump. The foot pump will inflate tires up to ninety pounds pressure. The pump case has room inside for the hose, tube repair kit, tire iron and work gloves.

Motor Scooters Sub for Ponies on Polo Field

Motor scooters are the polo ponies of Marshall, Mich., where the game is played on the airport field. A bit faster than bicycle polo, the motorized sport brings occasional spectacular spills, but it's easy to jump off and the injuries to players are few.



Exciting moment in a polo game on the Marshall, Mich., airport, where speedy motor scooters are used instead of ponies. They're easy to maneuver

Electric Tractor for Hotbeds Performs Multitude of Tasks



As it rides above row of hotbeds, this electric tractor thrusts out levers that open frames and then closes them after sowing or cultivating

More than a score of cultivating operations are performed by an electric tractor developed in Soviet Russia for working hotbeds. Driven by a three-kilowatt motor, it moves along the row of hotbeds, opening the glass frames by mechanical levers and then closing the frames as it moves on. By manipulating various levers in the cab, the operator can distribute soil, level it, mark out rows, sow vegetables, water

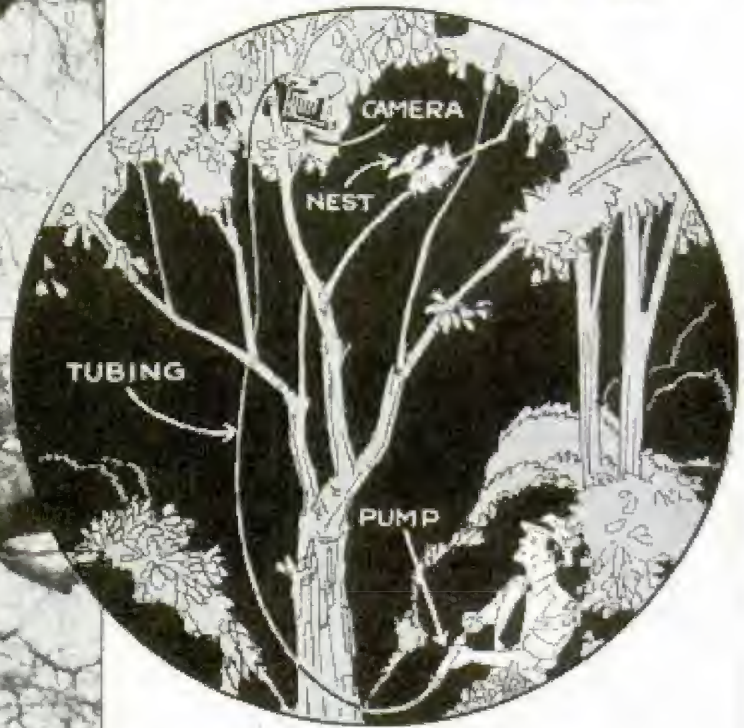
them, weed, fertilize and cultivate plants, and do various other tasks. Tanks on the tractor carry water, chemical sprays and fertilizers. Use of the tractor is said to raise the yield of the hotbeds forty to eighty per cent.

■An increase of more than 6,000 pilots and 1,400 aircraft in a year brought the total of American licensed pilots to 26,144 and of aircraft to 11,160 on July 1, 1939.

Civil Aeronautics
Anthony, 7/16/39

G 643. Cont. Herbert V. Webb, Apt. 3
4320 Secoya Road, N.

HUNTING



By William H. Lawrence



Top, left, the author photographing young hawks in nest. Right, sketch of camera setup with remote control. Bottom, young crows begging the cameraman for food

PATIENCE, ingenuity, and a spirit of exploration are the necessary ingredients for successful collecting of bird photographs.

The easiest and simplest way to start is with a feeding station. You will get better results in the winter and early spring, before an easy supply of the birds' natural food is available.

But birds are bashful. With the exception of chickadees and pigeons, I know of no species that will stay and feed while a man approaches and focuses his camera. There are three obvious solutions—the telephoto lens, the blind, and remote control of the shutter. The latter is preferred by many photographers.

It is possible to rig up a string trip for your shutter; but such a device is a makeshift at best. It frequently refuses to work when you want it to, or it will release the shutter unexpectedly while you are setting it up, thus spoiling a negative. It is possible to secure or make an electrical device for

Ref: William A. Lawrence
1410 Decatur St. #643

BIRDS with a CAMERA

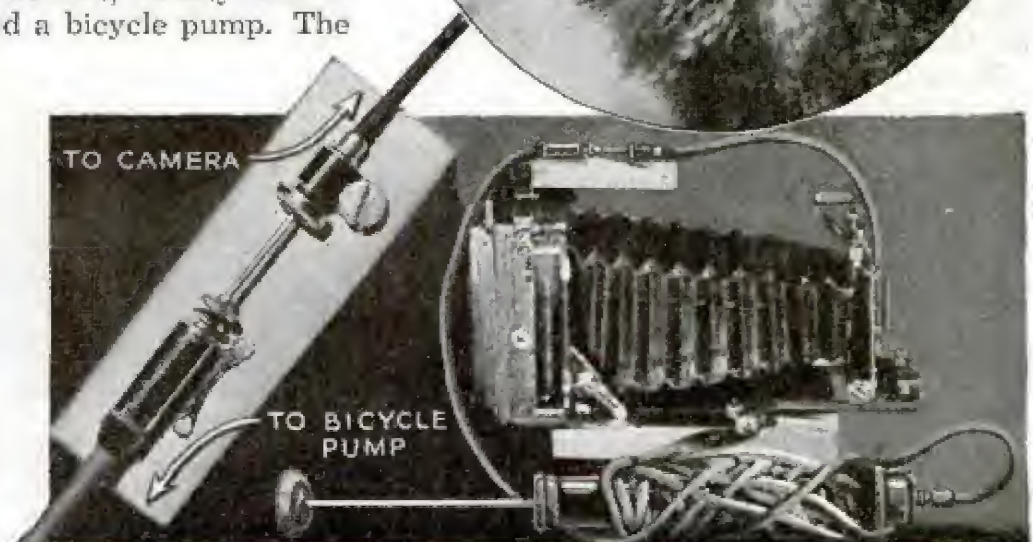


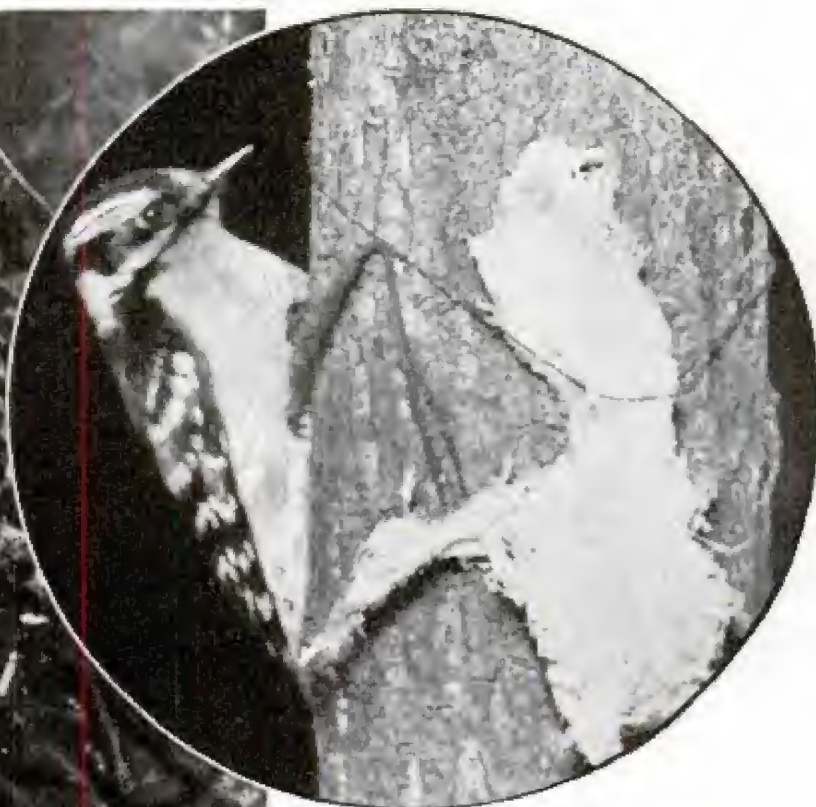
remote control, but most of those on the market are rather expensive and making one is an intricate job. Besides, the weight of the batteries, plus two lengths of wire, is a nuisance when roaming the woods.

One device that gives good results is cheap, easy to make, and practically fool-proof. It can be used on any camera equipped with a cable release. All you need is a kodak air release, a small block of wood and some screws, twenty feet or more of tubing, and a bicycle pump. The



Top, northern parula warbler feeding its young which photographer removed from nest before snapping picture. Circle, a good closeup. Bottom, parts necessary for remote-control camera hookup





kodak air release, standard equipment before the development of the cable release, may be obtained at most camera stores. Being cheap to start with, and now obsolete, the price should be nominal. It should be hooked up to the cable release of your camera with screws and a wood block. One end of the tubing is attached to the air release, the other end is hooked up to the bicycle pump.

Now you are ready for the birds.

First, the feeding station is baited. This station need not be an elaborate affair. You may use the stump of a tree, since it forms a natural background for the photograph. A site should be selected where the sun will shine on the station, and where the immediate background will not be confusing. The camera,



mounted on a tripod or otherwise securely fixed, is aimed at the station and the remote control is attached. Using a stick, or other convenient object, you determine where the subject will be in sharpest focus, then retire to the length of your control and wait quietly until a bird reaches the selected spot.

Suet will attract nut-hatches, chickadees and



Top, left, young great horned owl surprised on the nest. Circle, downy woodpecker lured into camera range with suet. Center, baby barn owl posing for the photographer, who had lowered the infant from nest and set it on a log, as shown in photo at bottom

woodpeckers. Sunflower seeds are relished by titmice and nuthatches. Bluejays will be attracted to nut meats. Sparrows and snowbirds will eat any kind of small seeds.

Most birds do not fly directly to a station, but approach it gradually, flying from limb to limb. You can take advantage of this habit to get a more natural setting by placing a good-sized twig in a crack of the stump, focusing on the end of the twig rather than the station itself. Woodpeckers and nuthatches may be obtained in natural poses if suet is tied to a tree, the camera being focused on the bait.

To obtain portraits of the more bashful birds, more deception is sometimes needed. Many birds notice every detail of their surroundings, and will not approach a new object until they have become accustomed to its appearance. The camera, here today and gone tomorrow, frequently keeps these visitors away from the station. A trick to overcome such timidity is to rig up a dummy camera, on the spot to be occupied by the real one, and allow it to remain for several days before any photographing is attempted. Any box of the approximate size of the camera, and painted black, will do.

To conceal your own presence, construct a simple blind near the station and leave it for several days. This is nothing more than a piece of burlap on a broomstick spreader, weighted at the bottom and hung from near-by trees. Through this burlap a small hole is cut for observation at the most convenient point. Even the most timid of feathered friends can be fooled by these simple devices. Of course the station must be supplied with food for several days, to accustom the birds to looking for it there. Then, when you are ready to take pictures, you simply replace the dummy camera with the real one, lead the tubing under the blind, and wait. When the bird reaches the selected spot, a quick stroke of the bicycle pump trips the cable release.

After you have captured all of your regular visitors on celluloid, you will want to go farther afield, secure portraits of birds that do not frequent your station. Here time and your own ingenuity are your only limits; for any part of North America contains enough birds to keep you busy a lifetime. Your best chance of photographing birds who do not visit your station is to

(Continued to page 135A)

Gun in Plane Wheel 'Pants' Fired by Remote Control

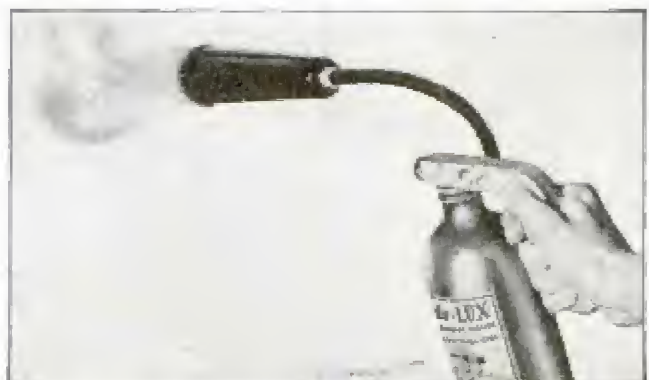


Adjusting machine gun in undercarriage of airplane built in to give extra power when making an attack

Fighting airplanes of the Polish air force are given greater attack power by placing machine guns in the steel fenders, called pants, which cover the wheels. Firing of the guns is controlled from the cockpit.

One-Hand Fire Extinguisher Is Worked Like Gun

Small fires that have not gained too great headway can be put out quickly with a lightweight extinguisher operated by one hand and aimed and discharged like a gun. When the trigger is pulled, liquid carbon dioxide is released, expanding rapidly into gas as it leaves the nozzle, blanketing the burning objects much like snow.



Extinguisher with pistol grip is light in weight so even a child can handle it in putting out fire

Walter Kidde & Co,
140 Cedar Street, N.Y.C.

Ailing Livestock Given Short-Wave Treatment



Short-wave diathermy is being used to treat diseased and injured livestock at several western ranches and animal hospitals. Radio transmitting sets operating on wave lengths varying from three to thirty meters are connected to rubber-clad applicator pads, and these are placed on opposite sides so that the waves will pass through the afflicted part of the body. First tried on ailing cattle, the short-wave heat treatments are now being applied to other animals.

At top, a race horse is given a dose of short-wave diathermy. Below, cattle become familiar with the transmitter



Dustproof "Beret" of Oiled Silk Keeps Books Clean on Shelf



Another new use has been found for those oiled-silk caps that cover dishes in the refrigerator and picnic lunches. Snapped over the top of a book, the elastic cap keeps out dust.

United States Will Have 70,000 Licensed Pilots by the End of 1941

There will be 70,000 licensed airplane pilots in the United States by the close of 1941, predicts Robert H. Hinckley, chairman of the Civil Aeronautics Authority. Already there are 26,144 certified pilots, 6,000 more than a year ago, and the normal

increase would bring the total to 43,000 by the end of 1941. But because of the current government student training program, under which 10,000 pilots will be trained each year, Hinckley expects the number to swell to 70,000 in a little over two years.

Science Service Aug 8. 1939

Ref: Dr. C. E. Wicktor, Los Angeles County Dept of Public Health, Los Angeles, Cal.
 Blossom City, Cal. 79 Madison Ave. New York City
 Santa Fe Springs, Calif.
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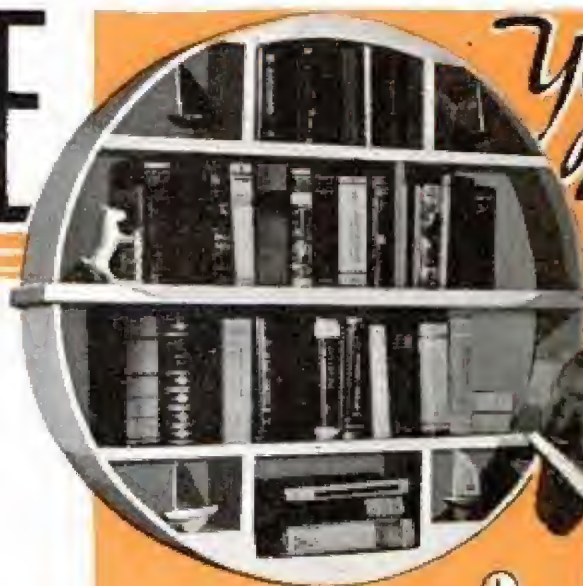
The CRAFTSMAN

ENCIRCLE

Novel, circular wall case keeps daily favorites at hand near your easy chair

By W. Keith Vining

HUNG at eye level this bookcase completes the furnishings of the livingroom or den. No need to be particular about the materials you use for it's finished in bright colors to complement the decorative plan of the room. A good grade of pine will do for the shelves and back while fir plywood can be used for the circular sides. The back is simply a disk consisting of a number of narrow strips of solid stock doweled and glued together. When the glue is dry, strike a circle of the required diameter as in Fig. 2 and saw away the waste. Then



Your Books



①

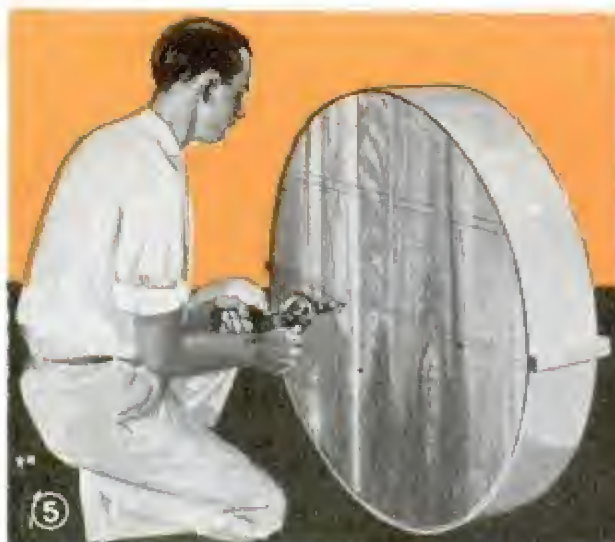


③



④

cut and space three shelves as in Figs. 3 and 7. Fit also the four vertical dividing pieces, Figs. 1 and 7. Cut these to approximate length but do not fasten them in place. The circular sides consist of two thicknesses of $\frac{3}{8}$ -in. plywood, each layer put on in two segments. The two segments of

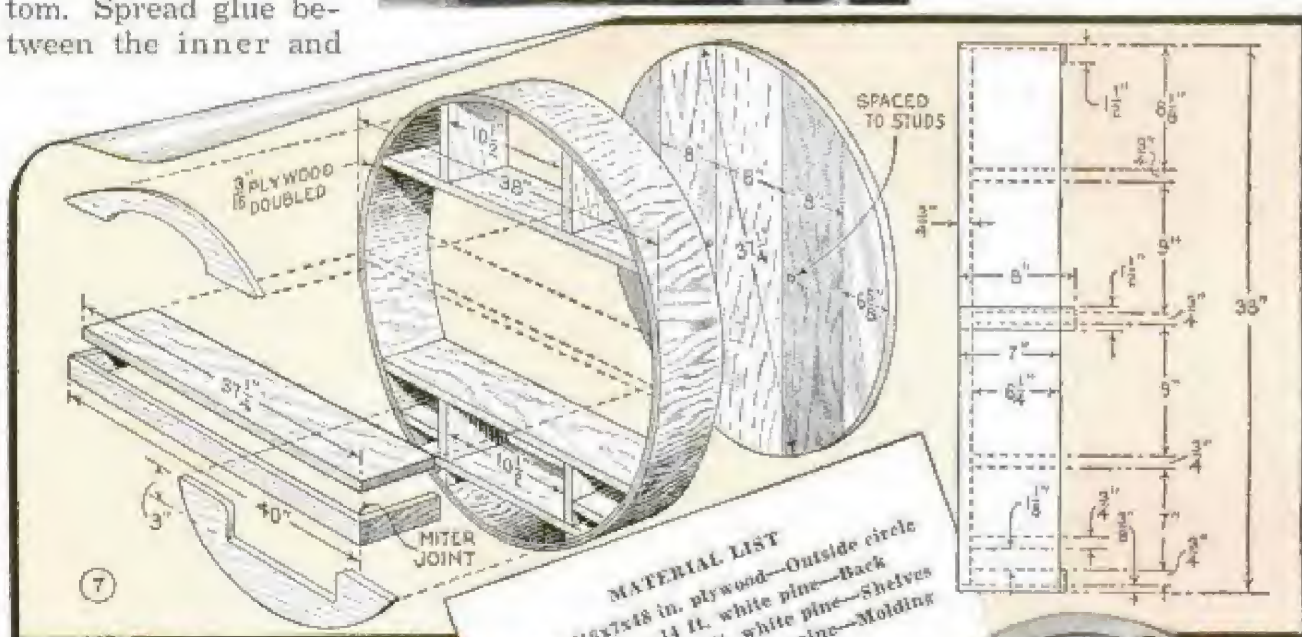


the first layer join at the centerline of the center or "equatorial" shelf. The outer two join at the top and bottom. Spread glue between the inner and



be anchored firmly to the wall as in Fig. 8.

Finish the case before you put it up. First go over the whole thing with progressively finer grades of sandpaper until the surface is smooth. Fill the exposed edges of the plywood sides with paste wood filler, and sand smooth. Then finish with two coats of enamel. Over porous, absorptive woods such as those used, it will perhaps be better to apply an undercoater first. When dry, sand this lightly. Follow with the first coat of enamel, laying it on rather thin. Apply the second coat as it comes from the can brushing only enough to level the enamel.

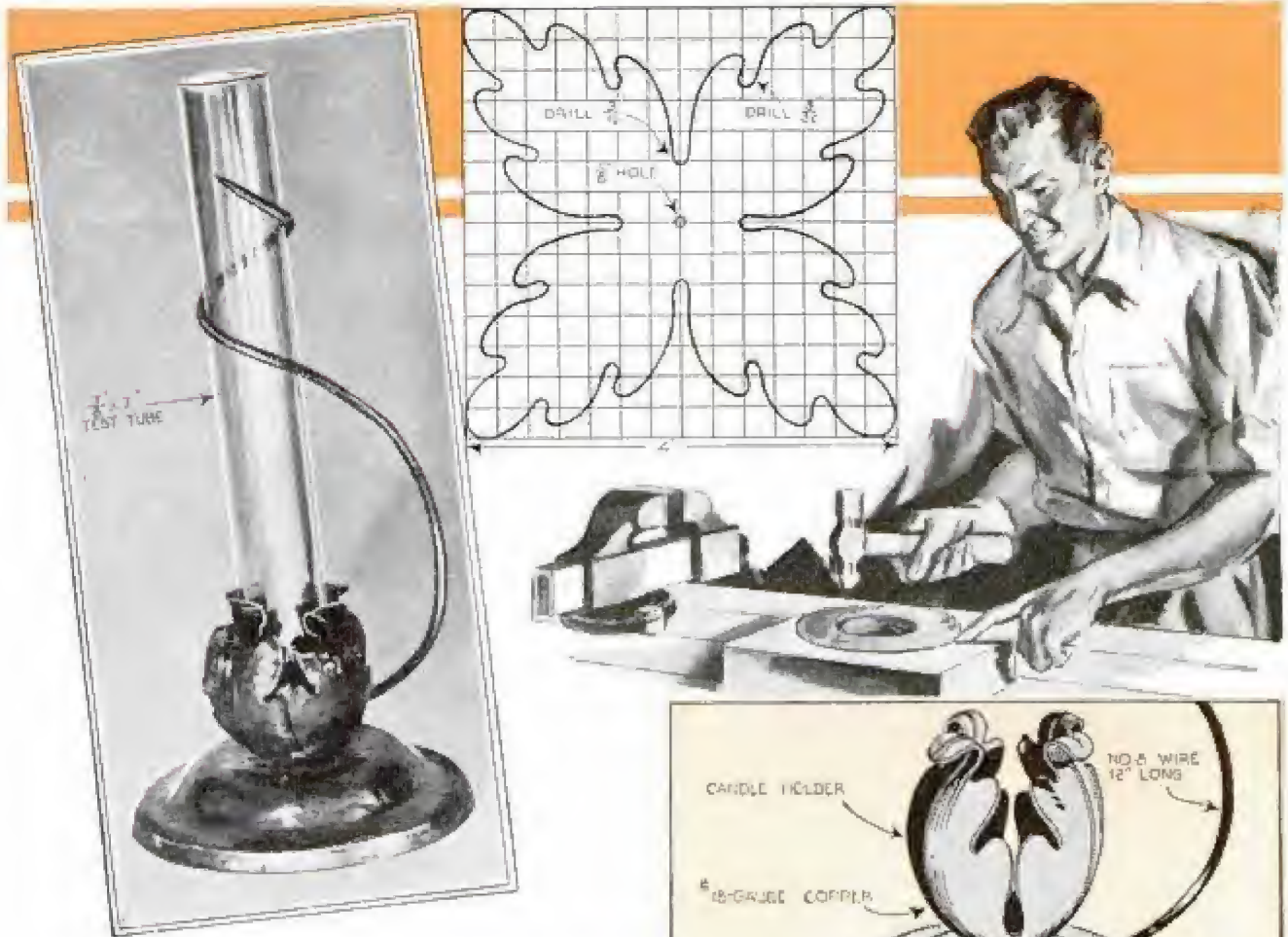


MATERIAL LIST
 6 pcs. 3/16x8x48 in. plywood—Outside circle
 1 pc. 3/4x8 in. x 14 ft. white pine—Back
 1 pc. 3/4x6 1/4 in. x 13 ft. white pine—Shelves
 1 pc. 1x1 1/2 in. x 5 ft. white pine—Molding
 1/4 lb. whiting, 1/4 lb. casein glue
 No. 8 finishing nails, screws
 Two 1/4x3-in. lag screws

outer layers, Fig. 4, and fasten at the joints with very small screws, and to the back with a row of heavier flat-head screws or casing nails, the heads being sunk with a nailset and the holes puttied over. Now, you can fit the vertical divider pieces which partition the shelves, and finish screwing the latter to the back as in Fig. 5. Note that the center shelf is finished with a facing strip, which extends around the sides over the plywood, Figs. 6, 7 and 8. Holes in the back for 1/4-in. lag screws should be spaced carefully to come exactly on the centerline of the studs so that the bookcase can

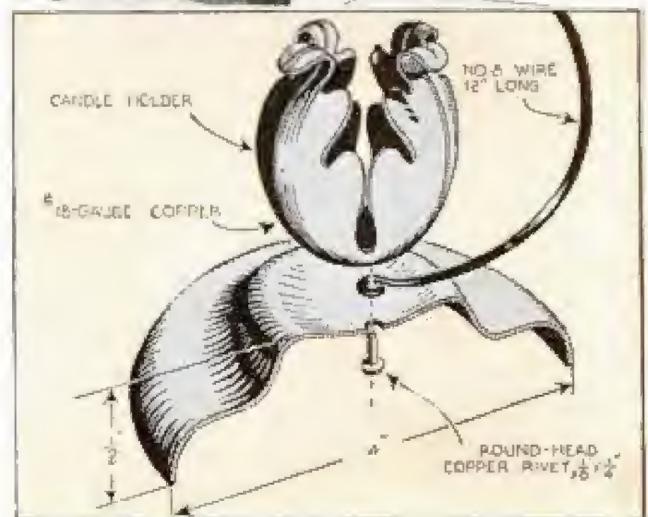


Small Vase Holder Hand-Wrought in Copper



Made either singly or in duplicate this bud vase will serve a dual purpose as a vase for choice cut flowers or as a novel candle holder. The vase proper is simply a laboratory test tube as you see, and the base is purely a hand hammering job in soft copper. To use it as a candle holder, you remove the test tube. Hand hammering of the two parts which make up the base and holder requires frequent annealing of the metal. To form the reverse curves in the base you can use a block of hardwood recessed on the lathe to the depth and shape which the base is to be. Using this as an "anvil" it is easy to draw the metal to form by hammering. A medium size ball-peen hammer is best for this work. However, make sure that the ball peen is bright and smooth. Rust spots or other irregularities will mark the metal. When the two parts have been hammered and shaped they are riveted together with the support wire between as in the detail above. Polish bright and apply a coat of clear lacquer to prevent tarnishing.

—Dwight Adams, South Gate, Calif.

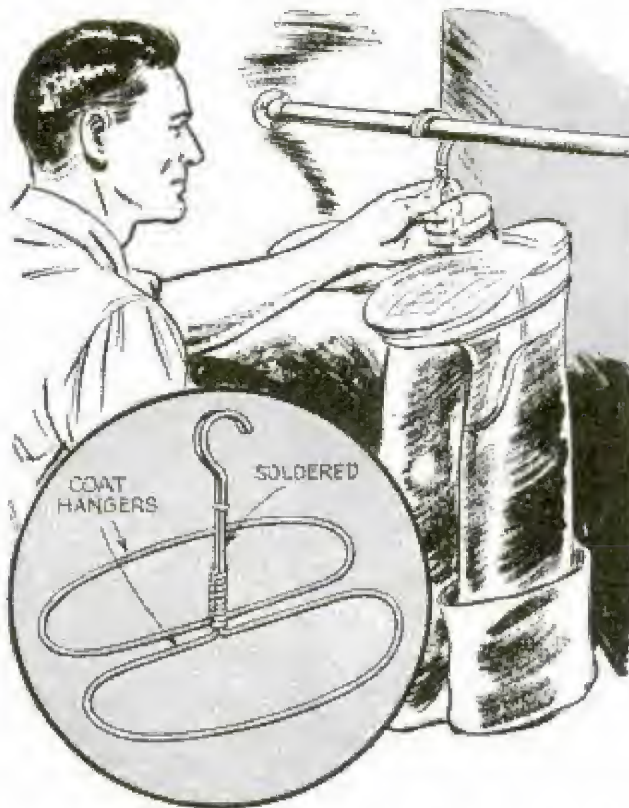


Clothespin on Stirring Spoon Keeps It from Slipping

A large stirring spoon can be prevented from slipping into a pan if an ordinary clothespin is slipped over the handle as indicated. A strip of adhesive tape wound tightly around the pin will hold it on the handle. In use, the clothespin rests against the side of the pan to keep the spoon from slipping.



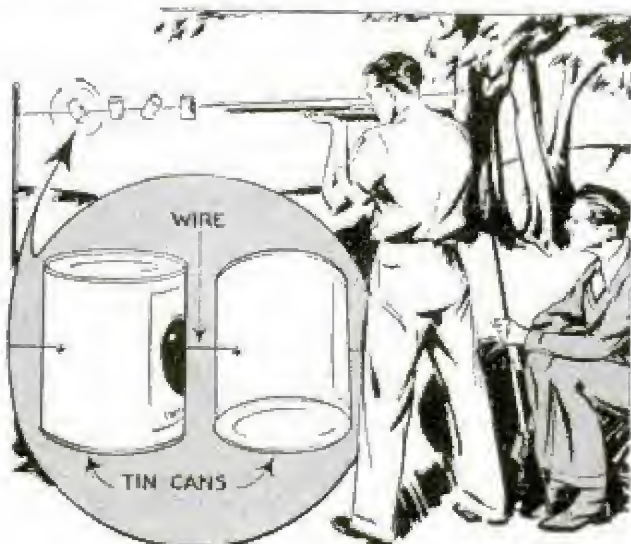
Rubber Boots Hung Up Easily on Coat Hangers



If you want to suspend your rubber boots in an inverted position so that they will not fold over and crack, bend a couple of coat hangers to the shape indicated and fasten them together with solder or wire. The boots are merely inserted through the two resulting loops in the hangers.

Tin Cans Threaded on Taut Wire Serve as Rifle Targets

Inexpensive rifle targets can be provided by simply stringing a number of tin cans



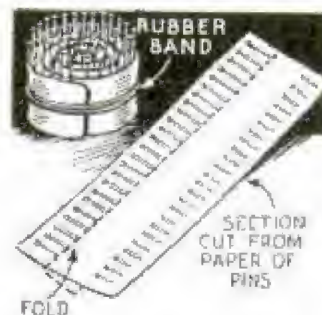
on a wire stretched tautly between a couple of posts or trees. If the cans are attached so that they are balanced, they will spin when hit from a suitable distance.

Hairpin Holds Button on Dress While Checking for Location

When the location of a button on a garment is critical, one seamstress slips a small hairpin through the button and cloth to hold it while checking to see if it is in the right place. If not, it is easy to pull out the hairpin and relocate the button before sewing it to the garment.



Package of Pins Cut into Strips and Rolled for Convenience



To make pins easy to remove from the original paper without folding and unfolding it repeatedly, one housewife cuts the paper into strips which are then

rolled as indicated and secured with a rubber band. This leaves the pin points protected but exposes the heads so that they may be removed easily.

Re-Knurling Handlebar Grips

When the knurling on the facings of motorcycle or bicycle rubber handlebar grips becomes worn so that the hands slip, the grips can be re-knurled with a hack-saw blade.

Cuts are made in the rubber spirally around the grip in first one direction and then the other, as indicated.



Snow-Man Refreshment Booth Used All Year

In winter this genial snow man dispenses warming sandwiches, and in summer ice cream and cooling drinks. Despite the novel shape of the structure, construction is well within the scope of the amateur carpenter. First build a circular floor, 6 ft. in diameter, upon three stout sills. These can be used for skids in moving about. Framing is erected as in the perspective drawing. Install lath vertically up to where the curve of the roof begins. From there on, bend them around horizontally. Stretch wire, crisscrossed, over the lath so that the building paper to be applied next will not bulge inward. Over the paper lay 1-in. mesh chicken wire, and plaster over with stucco. The extended left arm is covered in the same manner, except the hand which has fly-screen instead of chicken wire, that being easier to bend around the stubby fingers. The right arm is built directly against the side of the structure, and a cane is fitted on. Waterproof plywood and galvanized iron are used for the hat, which is painted black, with white lettering. The door is made in halves so that the top serves as an awning when swung upward. A vent can be cut under the brim of the hat, protecting it from the rain or snow. With a window in the side opposite the door, ample light and ventilation are provided.

☛ Your dishcloth will be sweet and clean if it is scalded daily in a pan of water containing a teaspoonful of washing soda.



Old Auto Tires Give Intense Heat When Firing Brush Piles

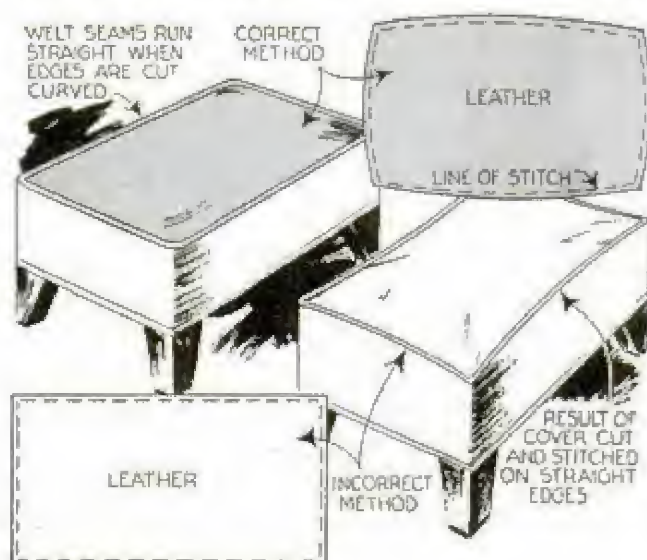


The problem of disposing of old auto tires is solved on the western coast by timber workers who use them to fire brush piles. One large tire properly placed and ignited will give off such an intense heat that a green brush pile is easily fired.

—James Bashford, Tacoma, Wash.

Cutting Upholstery Material to Make Straight Seams

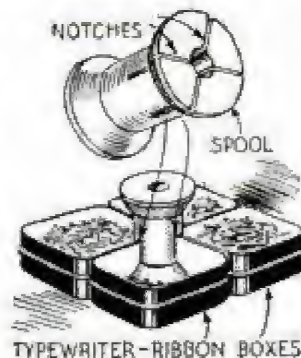
Unlike cloth upholstery fabric, the edges of leather and imitation leather material used for covering the tops of cushions, stools, benches, etc., must be cut and stitched slightly curved to make the welt seams run straight around the entire top



of the seat. If the edges are cut straight, the welt seams will bow in at the center on each side when the cover is stitched to the border and drawn into place.

Handy Household Nail Kit

By sawing two slots at right angles in the end of an empty thread spool and slipping it over the corners of four discarded typewriter-ribbon boxes, you will have a kit for carrying small nails or screws around the home. The spool may be attached to the boxes by small brads or glue.



Pencil Eraser on Garment Hook Keeps Hat in Place



If you are in the habit of hanging your hat on a garment hook and it has a tendency to fall off easily, just slip a pencil eraser of the type shown over the end of the hook. There will

be sufficient friction between the rubber eraser and the hat to prevent slipping.

Tool Rack from Solder Spool

A rack for small chisels, punches, screwdrivers, etc., can be made easily by drilling holes concentrically through the rims of an empty wire solder spool. The rims of the spool are bent over on one side so that it can be attached to a wall or the back board of your bench.



☛ A wet chamois will remove dog hair from upholstery without damaging the cloth.

Writing Cabinet Folds Flush with the Wall



This handy writing desk and file compartment for letters and papers requiring periodic attention can be built into any wall paneled in solid wood. The desk recess can be any convenient size, although if this is larger than the space between the studding it will be necessary to put in headers. Both the desk and file compartments will have to be framed in and provided with back panels of matching wood, in this case knotty-pine paneling as you

see it in the illustrations. The hinged front, which provides a writing surface, is formed by doweling and gluing together two boards to give the required width. The edges are beveled to match the paneling. When dropped to the open position, the front piece is supported on a single leg which is hinged near the top edge. As you see from the left-hand illustration above, the desk and file compartment are almost invisible when closed.

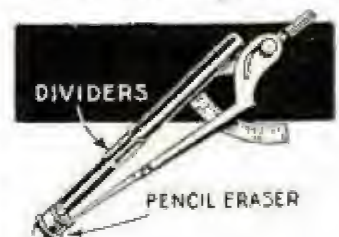
Thumb Loop on Cord to Avoid Dropping Electric Razor



Have you ever had your electric razor slip out of your hand while shaving and drop to the floor? Breakage and other damage to the razor by having it drop on the floor or washbasin can be avoided by taping a looped shoestring to the razor cord to slip over the thumb while using the razor as indicated.

Guard for Points of Compass

A pencil eraser of the slip-on type provides a good guard for the sharp ends of a compass. The eraser is stretched over the points where it is held securely in place by its own elasticity.





CHOICE *in*

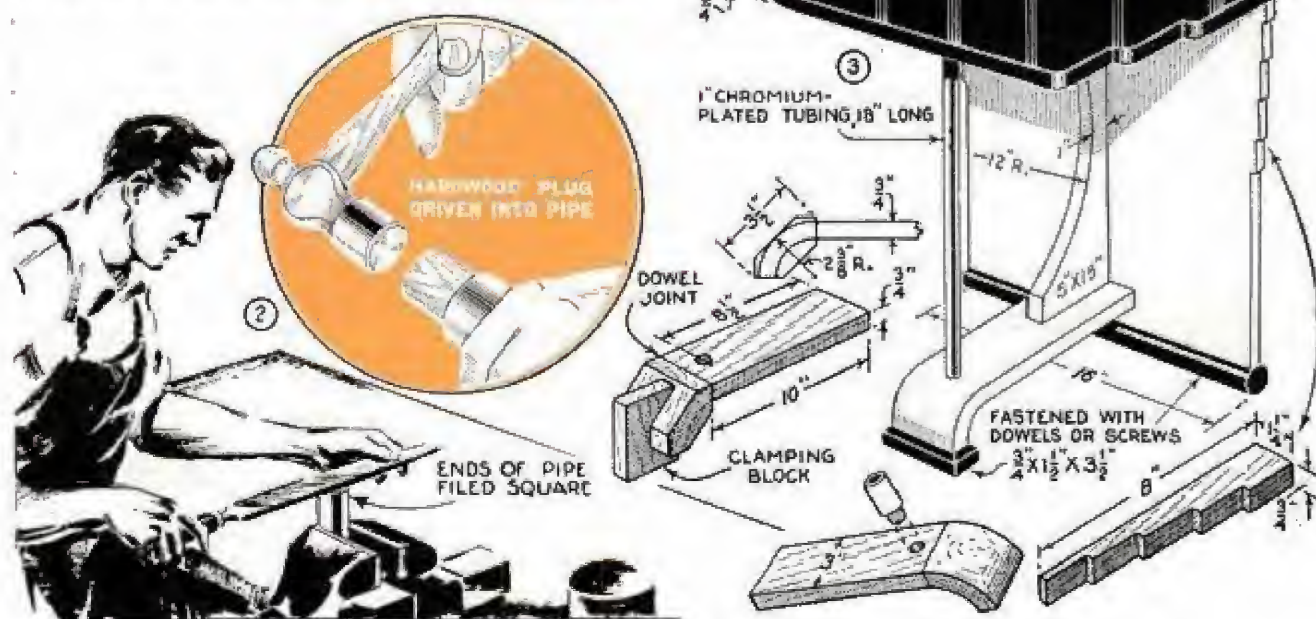
Practical Designs in Modern Styling
Offer Dual and Single-Purpose Types

By WAYNE C. LECKEY

INEXPENSIVE plywood combined with gleaming metal, lustrous plastics or glass makes any of these smart coffee tables, finished in either enamel or varnish, fit well among modern furnishings. They can be made easily in your own workshop.

Ideal for limited space is the dual-purpose table shown in Fig. 1, which, when made in duplicate, can be adapted readily as either an end table as shown, or the two

can be placed together to form a convenient coffee table as in Fig. 4. The top is cut from walnut-faced plywood with the edges painted to conceal the laminations of the stock. Also of plywood, the back with decorative pieces glued to the sides has a 16-in. length of standard 1 $\frac{3}{8}$ -in. closet pole stock flattened and doweled to its lower edge. The curved foot is formed by doweled an angle-cut block as shown in Fig. 3, to a 3 by 10-in. solid piece, which can be cut from the waste stock left from the curved center upright. To glue, a block is first cut as in Fig. 3, to hook a bar clamp over. After the glue has dried, the proper curve is laid out on the edge and band-sawed to line as in Fig. 12. If need be, this can be worked out by hand with a gouge, plane and sandpaper. The foot is then bored for a length of 1-in. chromium-plated tubing which is squared and plugged at both ends with a tight fitting, hardwood

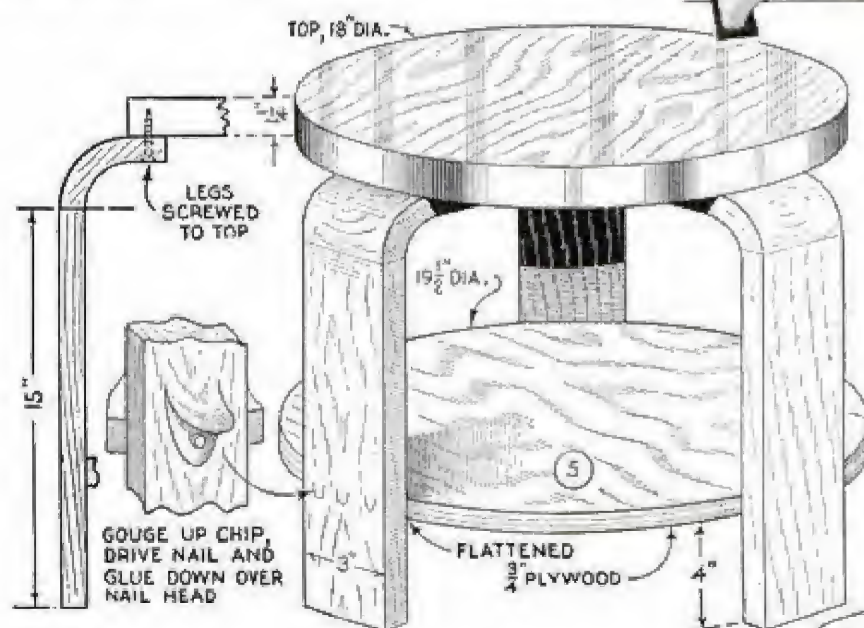


Small TABLES

dowel, Fig. 2. In fastening the top with dowels, allow it to extend $\frac{3}{4}$ in. over the back.

The table in Fig. 5 employs the same method of forming the legs, which are spaced equally and screwed to a circular top of $1\frac{1}{8}$ -in. solid stock. This you can build up from narrow widths of cheap material and veneer over with walnut. The lower circular shelf is slightly flattened where the legs join the edge. You can nail through the legs and cleverly conceal the nail heads by raising a chip with the grain and later gluing the chip back down over the head as shown in the detail, Fig. 5.

Angle-bent legs of 2-in. flat iron form the support for the thick circular top and bottom of the table shown in Fig. 6. These are drilled for attaching with bright-headed wood screws and are then chromium plated.



enameled, black top, the base, if desired, can be veneered with $\frac{1}{16}$ -in. sheet aluminum, soldering with aluminum solder to a band covering the edge.

Ultra modern is the table shown in Fig. 11, which is composed of a top and bottom of $\frac{1}{2}$ -in. plywood spaced apart with a 2-in. chromium-plated center column and three plate-glass vanes set in grooves routed in the surface. Assembly is made as shown in

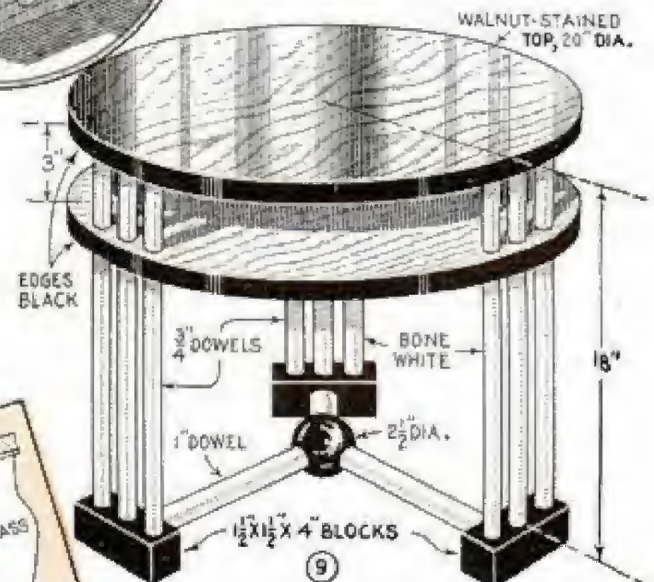
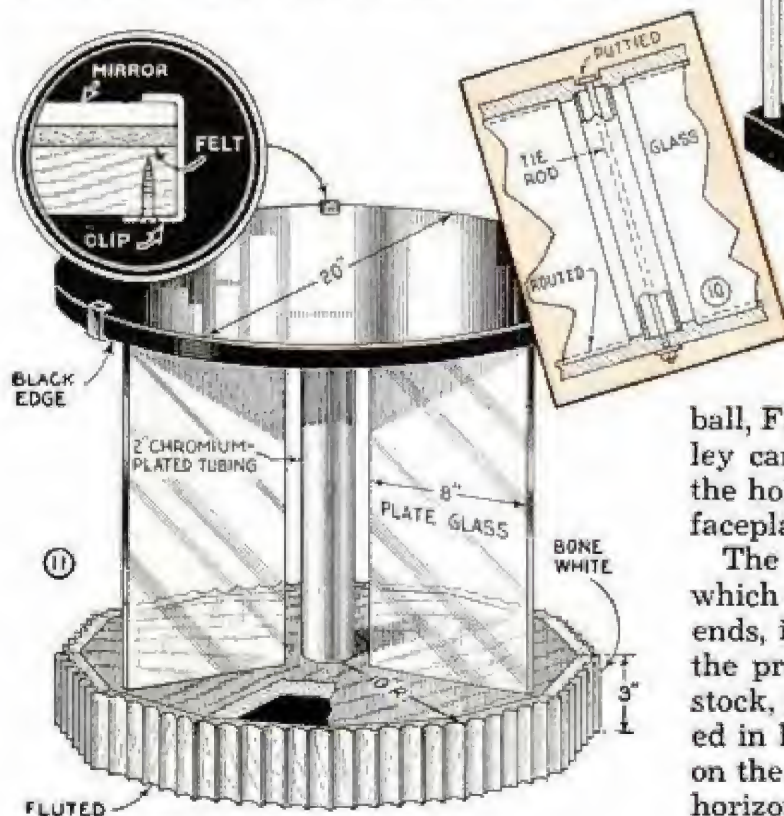




of the glass. If you have an old round, beveled-edge mirror at hand, you can save on cost by building the table to fit. The wood surfaces done in bone white will give a pleasing appearance.

Utilizing standard $\frac{3}{4}$ -in. dowels for legs, the table in Fig. 9, has a "double" top made from two disks spaced 3 in. apart. If you have a shaper you can cut the circular tops for any of these tables by using a jig. After the disks have been bandsawed to the rough circle they can be placed on the jig and revolved past a straight-faced cutter, thus producing identical pieces. Both disks for the table in Fig. 9 are stacked and bored together to assure proper alignment of the holes, the holes in the top disk being bored blind. Fitted and

Fig. 10, with a tie bolt threaded at one end for a nut and washer. A base attached to the lower disk and fluted as shown in Fig. 11, is formed from twelve segments angle-cut at 75 degrees and glued and fastened together with corrugated fasteners. Over a layer of $\frac{1}{8}$ -in. felt, the top is covered with a circular mirror held in place with three or four stiff metal clips bent to hook over the edge

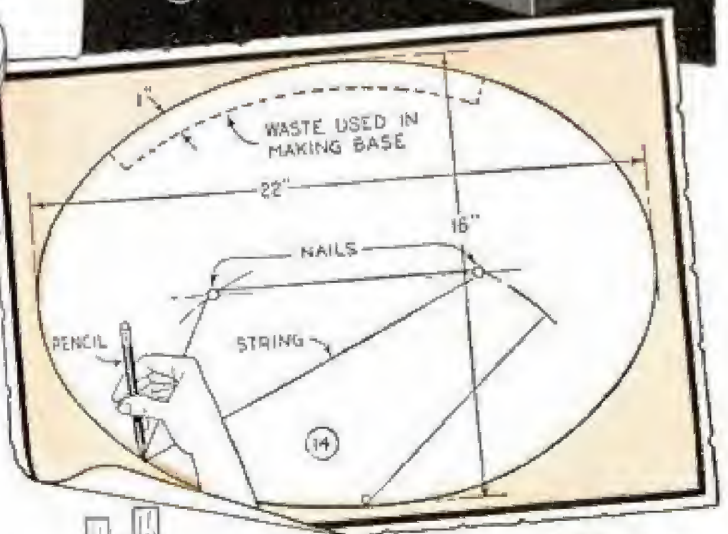
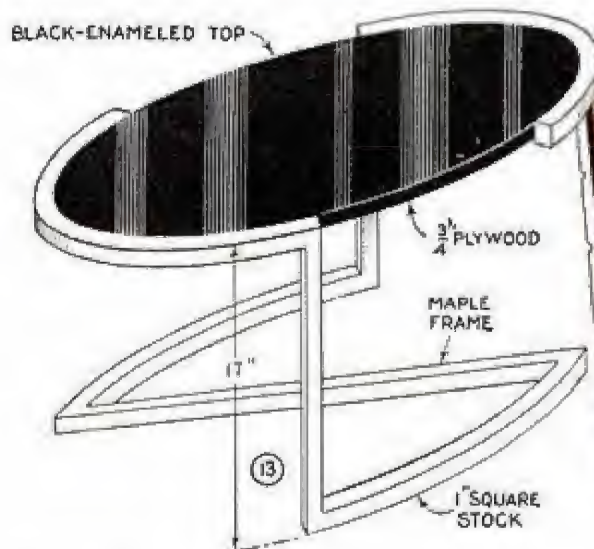


glued in square blocks at the bottom, the three sets of dowel up-rights are connected with 1-in. round stretchers which terminate at the center in a $2\frac{1}{2}$ -in. turned ball, Figs. 7, 8 and 9. Your lathe index pulley can be used to advantage for spacing the holes while the ball is mounted on the faceplate.

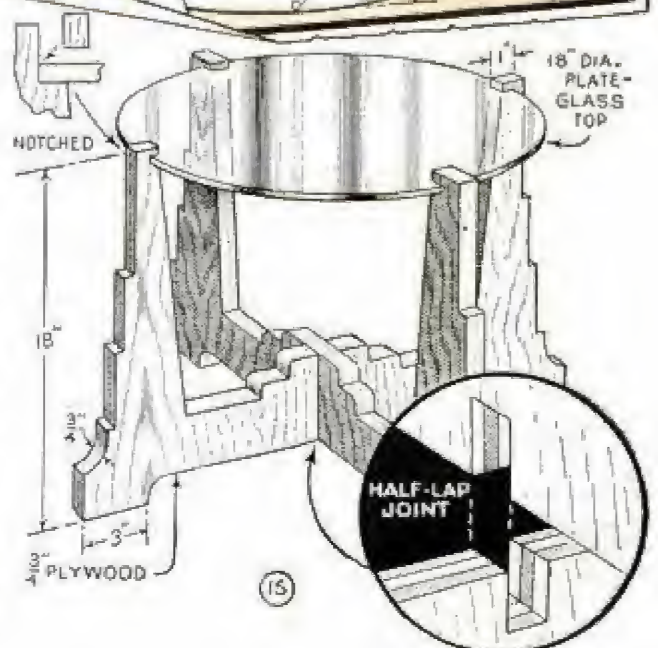
The top of the table shown in Fig. 13, which appears to have pieces added at the ends, is actually one piece. Fig. 14 details the procedure in laying out the top. The stock, plywood is preferable, is first divided in half both vertically and horizontally on the underside of the work and then the horizontal line is bisected by striking an

arc from the corner as shown. Nails are then temporarily driven in at these three points around which a string is tied. Replacing the nail with a pencil, you can draw a perfect ellipse by keeping the string taut. After the top is cut to shape, draw an inner ellipse 1 in. in from the edge with a marking gauge. Using a fine blade, a section of this is jigsawed out to form part of the S-shaped base which is made up by doweling to upright and cross members. Using the inner ellipse line scribed on the top as a guide, paint the top black and the rest in bone white. A top of clear plate glass is used on the table shown in Fig. 15, fitted in notches cut in the four uprights which are formed from two pieces assembled at right angles with a half-lap joint.

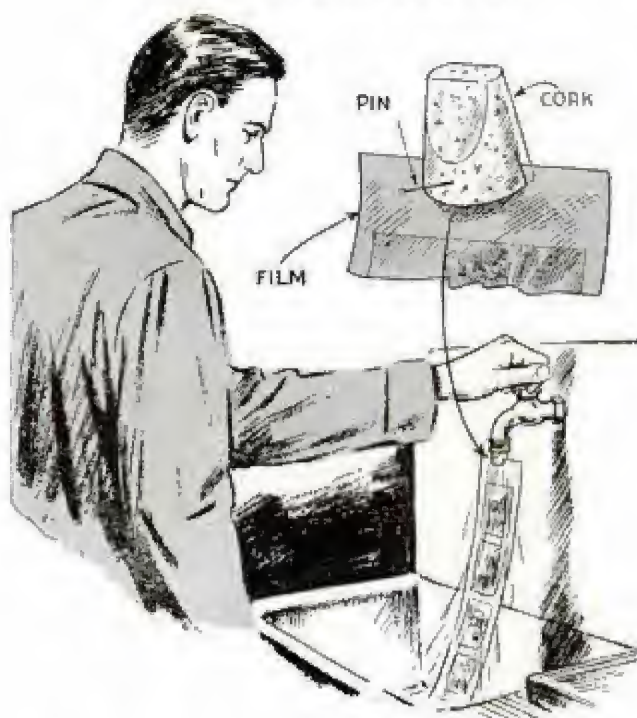
Care in finishing has much to do with the beauty of any of these tables. Even where you use combinations of bone-white and black enamel irregularities in



the surface will show through. The surfaces must be smooth and this means considerable hand work with sandpaper and a block. Use a medium coarse grade of sandpaper to start, then finish with a fine grit. When this can be done before the parts are assembled so much the better. It's always best to use an undercoater as a base coat under enamels. Avoid laying this on too thick. It is better to apply two thinner coats than to risk "piling" and "sagging" of the undercoater. When the latter is dry, sand it very lightly with fine paper, then lay on the first coat of enamel and when dry sand again lightly. The final finish coat should then level nicely in drying.



Cork Holder to Wash Photo Film under Water Faucet



Here is a cork that will hold strips of film under a water faucet so that both sides will be washed efficiently. The cork is slotted at the wide end and opposite sides are flattened at the other. In use, the film is slipped into the slot and anchored with a pin through the margin, after which the cork is forced into the faucet and the water turned on lightly to flow down the back and front of the film.

Flashlight Aids in Turning Bowls

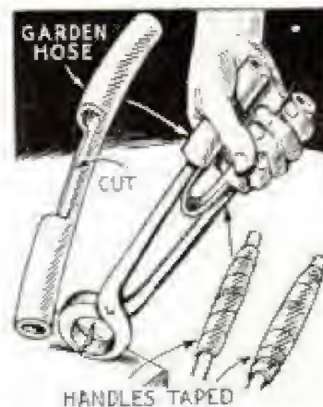
A small pencil-type flashlight is a great aid in boring deep bowls to a smooth finish. It is taped to the boring tool so that the beam of light spots at the cutting



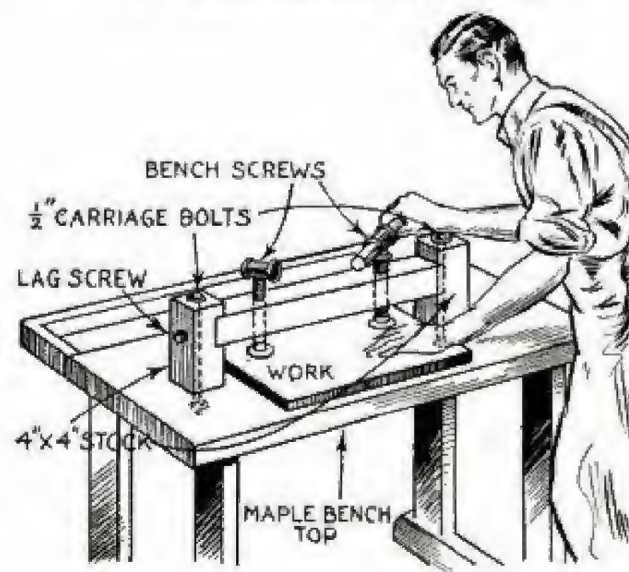
edge. This light shows up the defects in a manner that cannot be obtained with an outside beam.

Hose on Handle of Nail Clippers Avoids Pinched Fingers

Have you ever pinched your fingers between the handles of a nail clipper? If so, cut a piece of garden hose as indicated, and slip it over the handles. Besides cushioning the handles, the hose makes the tool self-opening, and easy to operate. If the hose is too large, a few wrappings of tape on the handle will make it fit tightly.

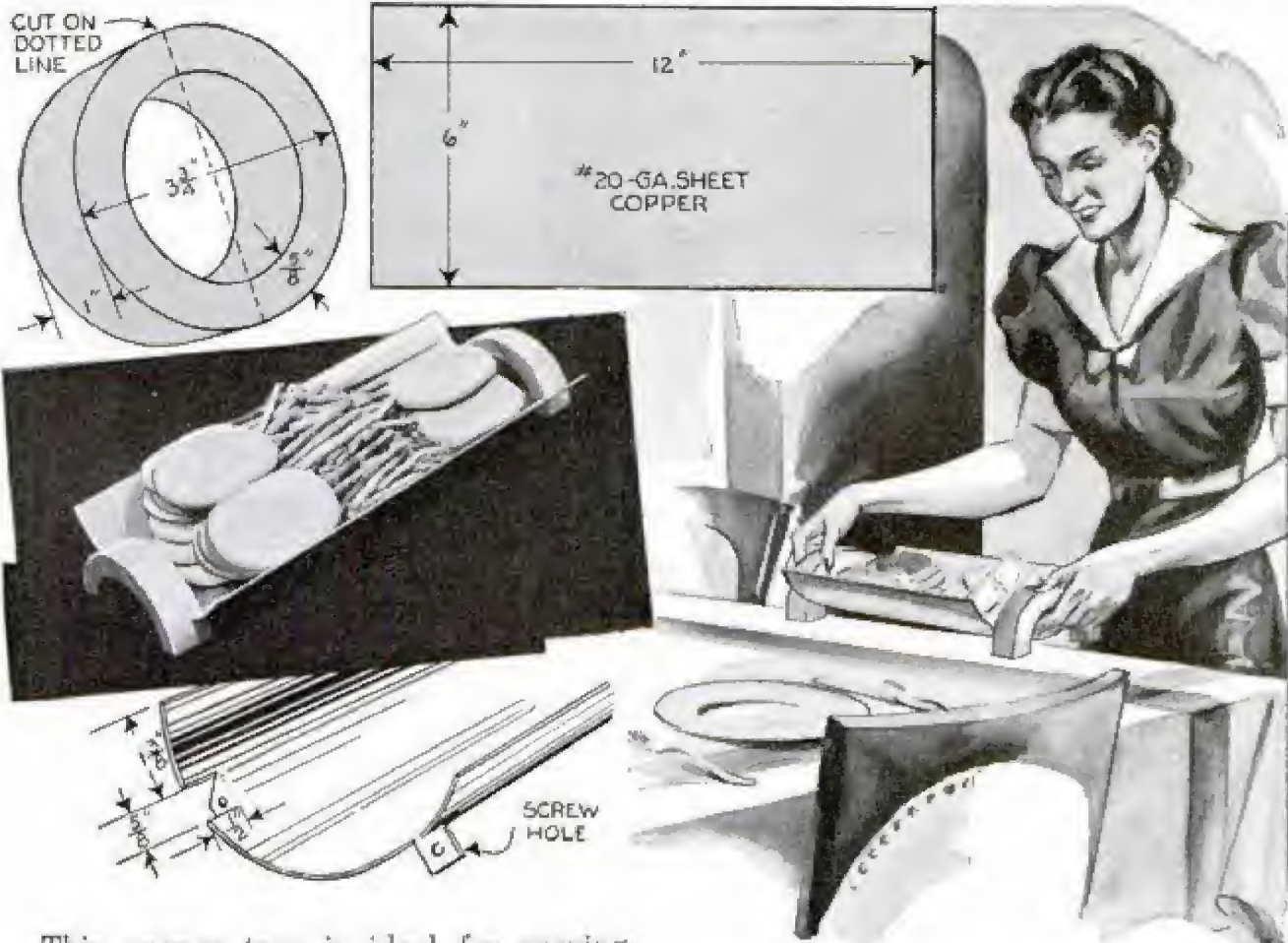


"Bench-Top" Veneer Press Set Up or Dismantled Quickly



Using the flat, solid maple top of a shop bench to serve as a base, one manual training instructor made this simple press, which could be set up quickly for occasional jobs of veneering. As shown, several bench screws fitted into a sturdy 4 by 4-in. frame are used to apply pressure to the work. Holes for heavy $\frac{1}{2}$ -in. bolts, which extend through short vertical members, are drilled through the bench top for fastening the frames rigidly in place. Several units, spaced a short distance apart, can be used when the work varies in size.

Tidbit Tray of Curved Copper Has Wood Ends



This copper tray is ideal for serving cookies, candy and other tidbits. It consists of a sheet of copper curved to a radius of 9 or 10 in., and two half-circular end pieces. The latter are halves of a wooden ring, each piece being grooved deeply to

take the ends of the copper. Two tabs formed at each end of the copper provide a means of attaching the circular ends with screws.

—Dale R. Van Horn, Lincoln, Nebr.

Old Phonograph Put in Small Plywood Cabinet for Child

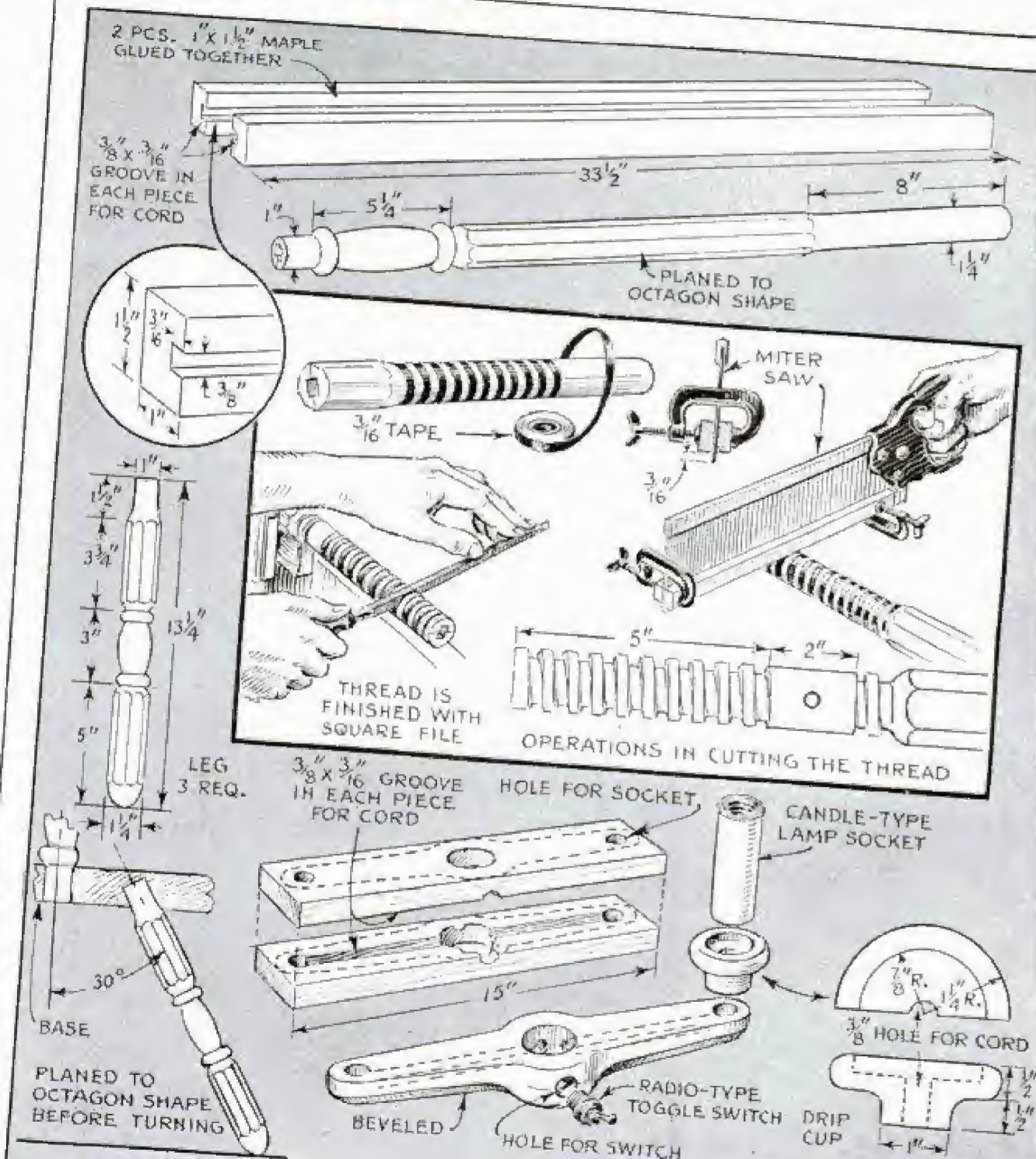
Have you an old phonograph that has been discarded? If so, put it in a small cabinet, paint it in bright colors and present it to some child. The fun the child will get out of having its own phonograph will more than repay you for the two or three dollars cost. You can make up a cabinet of 1/2-in. plywood with butt joints fastened with screws. As the cabinet is painted, you can use inexpensive material. The cabinet shown stands 2 ft. high and has space for records and story books in the bottom.

—O. Evans Duemler, Pasadena, Calif.



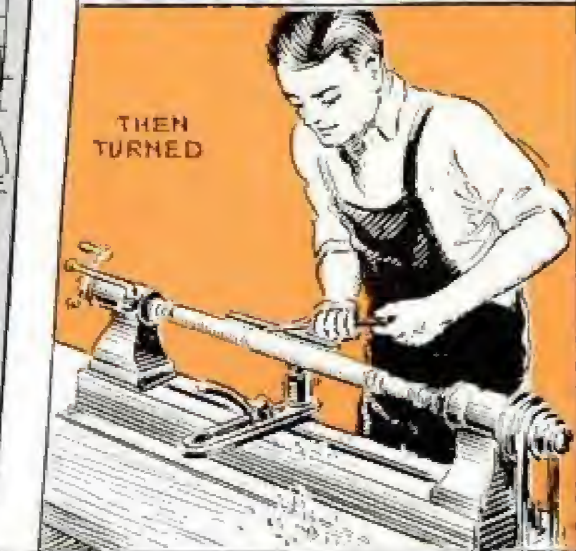
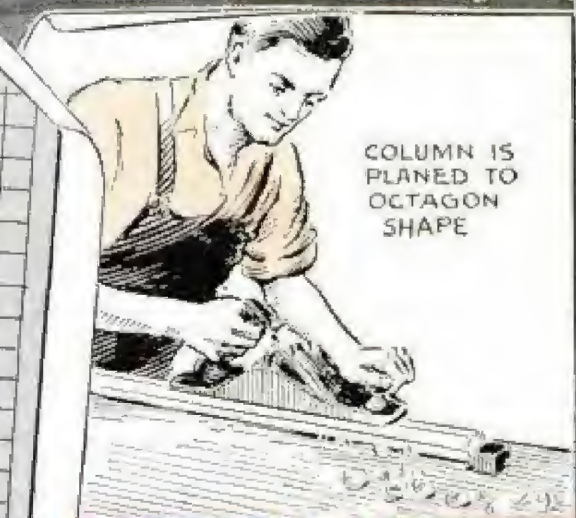
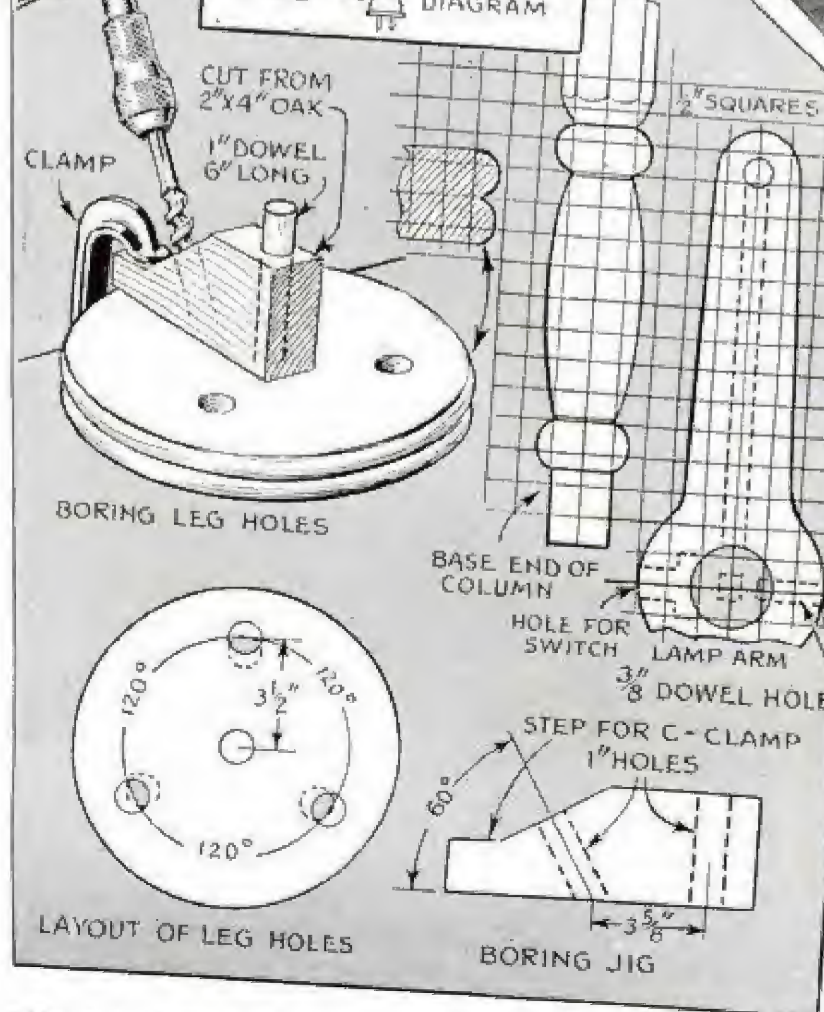
❑ If candle grease spills on a highly polished wooden surface, heat a clean dust cloth and hold it over the grease until it becomes soft so that it can be wiped off.

COLONIAL FLOOR LAMP



Although this lamp has a threaded column, the thread is for appearance only as the crossarm is pinned securely to a round section of the column so that the arm does not turn. As you see in the details above, the thread is laid out on the round stock then cut in with a saw and finished with a square file. The column is built up of two halves grooved at the center to take the cord. After gluing, the column is planed to the octagon shape, then turned down at the ends. Sand the turnings in the lathe so that you have them smooth before assembling. Finish in a honey color with stain, shellac and wax.

has hand-cut screw



Rubber Straps on Trouser Belt Support Boot Tops



Fishermen, hunters and others who wear hip boots will find these rubber strap supports for the tops convenient, as they can be attached or detached in an instant without buckles or fasteners. The straps are cut from a discarded inner tube and engage the wearer's belt. The arrow-head ends of the straps are easily drawn through the loops of the boots to hold them up.

Folding Rule Holds Data Sheet on Bench for Reference

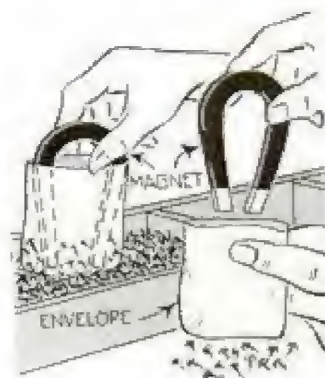
When working from a printed formula, clipping or drawing on a workbench, a folding rule provides a good emergency



support to hold it upright so that it can be read easily. Fold the paper over a piece of cardboard and insert it between sections of the rule as shown.

Envelope Removes Small Tacks from Permanent Magnet

Before using a permanent magnet to gather up small tacks or metal filings, slip it into a thin paper sack or envelope. The magnet will lose little of its power, and the paper can be removed to dislodge the metal.



Extending Hook in Key Purse

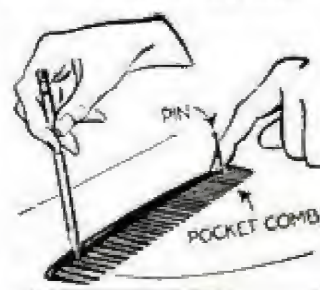


When a small key is carried in an ordinary key purse, the difficulty of inserting it into a lock because of the short hook on the purse can be overcome with an ordinary paper clip. This is merely fastened into the key eye and

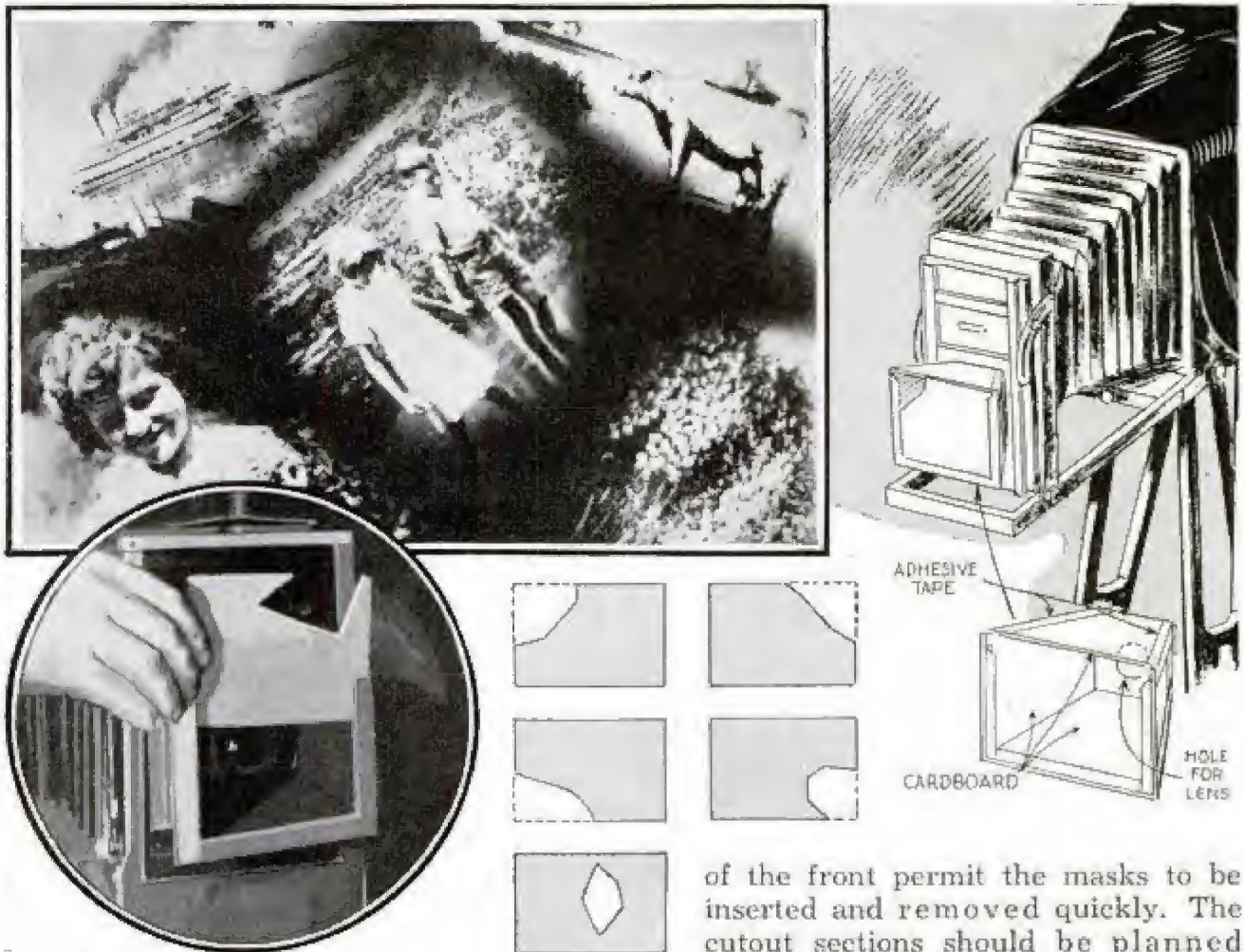
the hook of the purse as indicated. Also, a paper clip may be used to identify a certain key in the dark.

Pocket Comb Used as Compass

Next time you need a compass and none is at hand, a pocket comb and a pencil will serve the purpose. Sharpen the pencil point to slip easily between the comb teeth. Then hook one end of the comb over a pin driven into the work and revolve the pencil to draw the circle. If the comb is to be used often for this purpose, drill a small hole through one end in which to insert the pin.



Camera Lens Masks to Make Photomontages

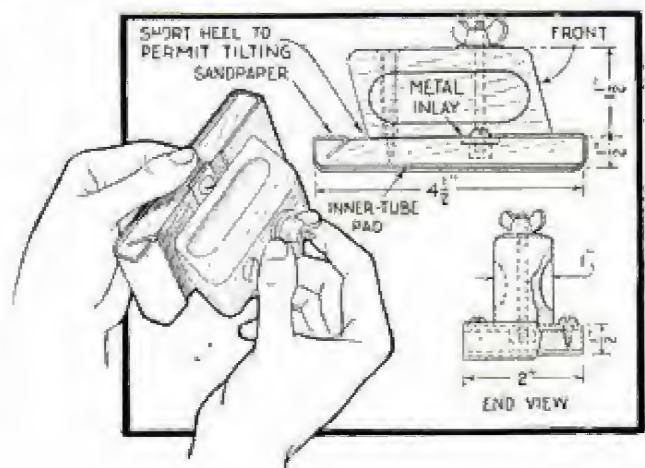


Photomontages—blended pictures on a single negative such as shown above—are easy to make by using lens masks with cutouts, so that portions of the negative can be exposed in sequence. A simple mask holder which fits over the lens may be assembled from pieces of cardboard taped together at the edges. Slides on each side

of the front permit the masks to be inserted and removed quickly. The cutout sections should be planned carefully so that exposures will not overlap, but will blend together at the edges, and so that the entire negative will be covered as you use the masks progressively. While simple cutouts as shown above will do, "saw-tooth" edges will give a more gradual blend. Uniform negatives can be obtained by taking the various pictures under similar lighting conditions.

Handy Sanding Block Permits Instant Change of Paper

To change the paper on this sanding block, you merely loosen the wingnut on the quick-acting hand grip, which holds one end of the paper. A slit cut at an angle across the top of the block holds the other end. Resiliency is provided by sheet rubber glued to the underside of the block. When making the block, allow sufficient clearance for both the screw and the bolt in the hand grip so that it can be tilted slightly. Standard 9 by 11-in. sandpaper sheets are cut to 2 by 9-in. strips to fit the block.—L. Schmitt, Chicago.



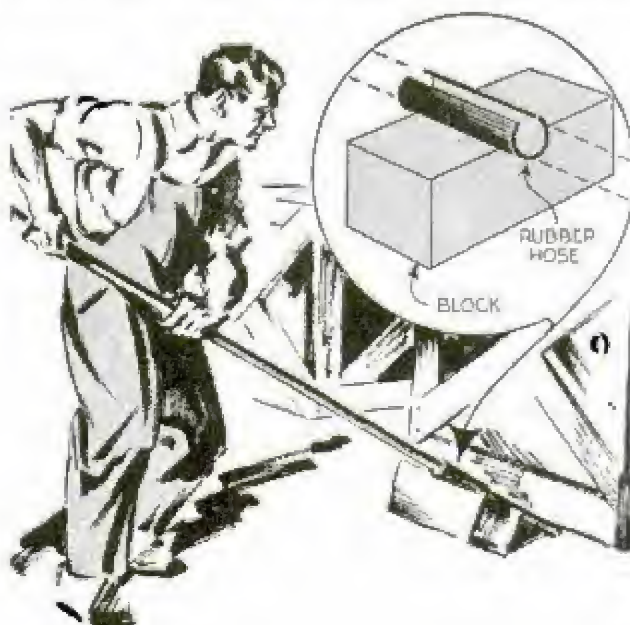
Window in Pocket to See Watch Without Removing It



One man who carries a pocket watch cut an opening on the inner side of his pocket and sewed a piece of transparent celluloid over it so that he could read the watch without removing it. This not only helped avoid dropping it, but enabled him to tell time by merely pulling back his coat.

Fulcrum Block Attached to Bar by a Length of Hose

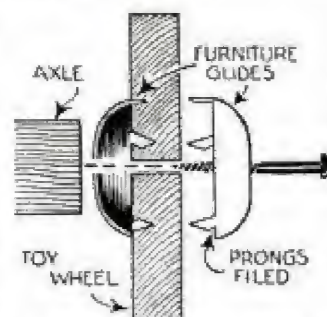
To avoid carrying a fulcrum block about when moving heavy crates or machinery, slit a short piece of rubber hose and tack it onto the block. The hose may be opened



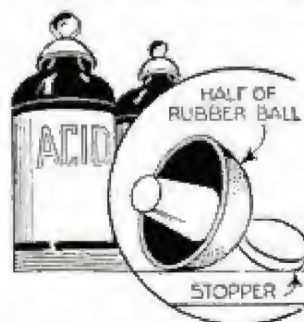
to engage the bar and will hold the block securely so that the operator need not stoop each time to move the fulcrum.

Furniture Glides Provide Bearings on Toy Wood Wheels

Pressed into each side of wooden wheels used on homemade toys, large nickel-plated furniture glides drilled through the center provide bearings and neat hub caps. To assure that the holes in the glides will be in alignment and centered perfectly, drill the wooden wheel and the two glides through the center first. Then, using the same drill bit as an axle, slip the glides over each end and press the points into the wood.



Half Rubber Ball Is Shield on Acid-Bottle Stopper

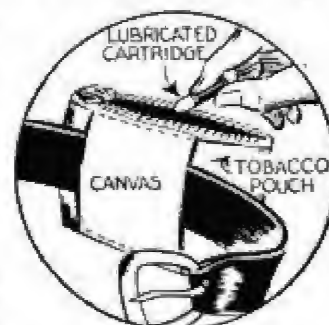


When a glass stopper is removed from an acid bottle and laid on a table or counter, it may be moist enough to damage the surface. If a hollow rubber ball is cut in half and

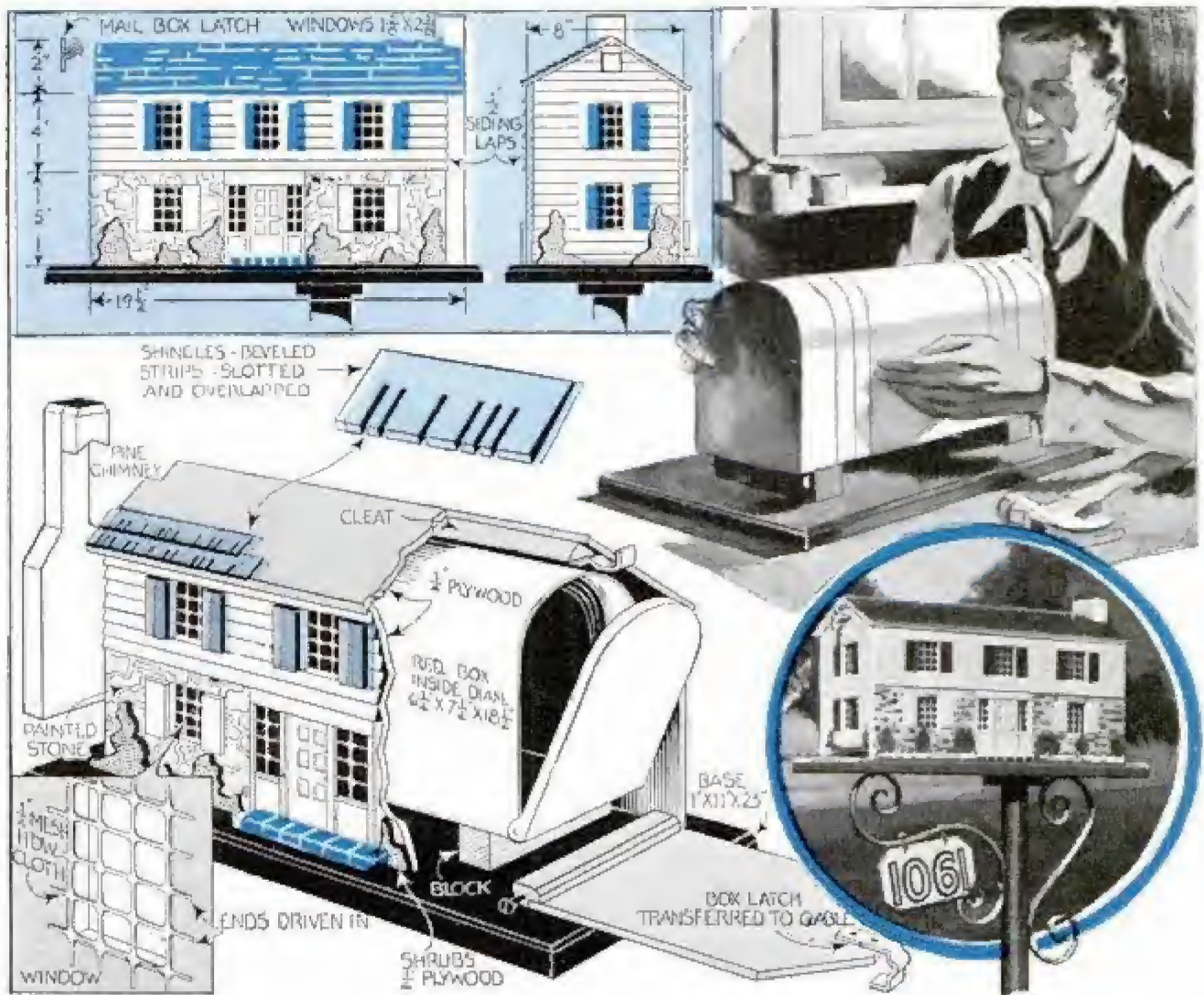
slit in the center to slip over the knob of the stopper, it will prevent the moist end of the latter from touching the table.

Cartridge Pouch Slips over Belt

While hunting or target practicing, this pouch is just the thing in which to carry cartridges. It is a rubber-lined tobacco pouch, with a strip of canvas or other cloth sewed on one side to provide a loop through which your trouser belt is slipped.



Attractive Model House Conceals a Mailbox



Patterned after the trim two-story colonial type featuring a combination of masonry and wide clapboards for the walls, this house model is designed to enclose the standard-size rural mailbox without altering the box in any way or making it inconvenient for the postman. Walls and roof boarding are of $\frac{3}{8}$ -in. plywood. The chimney and base are of solid stock. Two cleats, or blocks, attached to the base support the mailbox at the proper height. Imitation masonry is painted on the lower half of the walls as indicated. Siding is ripped from $\frac{1}{2}$ -in. stock into thin, beveled strips of uniform thickness. Shingles are made in the same way. Both are attached with small brads and glue. Note that one end of the house is hinged to the base to give ready access to the mailbox. Windows are made by cutting sections from hardware cloth, leaving the ends of the cut wires projecting about $\frac{3}{8}$ in. The ends are then

turned so that when the cloth is placed over the window opening the bent ends can be driven into the wood to hold the wire securely in place.

Beach Pebbles Assure Action of Salt Shaker



Campers who frequently have to pulverize their salt to keep it in condition to flow freely from the shaker, will find that much of this trouble can be avoided by dropping a few clean beach pebbles into the con-

tainer. The pebbles tend to break the lumps of salt when the shaker is used.



Starting Early on the



Built of plywood, this roomy, substantial doll house in French chateau style may be wall-papered or painted inside; has "stucco" outside walls with "stone" corner trim, realistic celluloid window panes, a cozy fireplace, and it can be wired for tiny lights. Front door, under curved balcony, has a real latch and hinges. Entire front and back are removable for easy access to the interior

By Lowell R. Browne

A MODIFICATION of the clean-cut French chateau style of architecture presents a pleasing design for this doll house, Fig. 1. It has three bedrooms and bath in addition to upstairs hall, kitchen, dining room and a living room the full width of the house. All windows are fitted with sash, celluloid panes and shutters, and the front door has a real latch. Floors are in natural finish and each room is papered. If desired, the structure may be simplified considerably by eliminating the window sash, stair rail and treads, wallpaper, baseboards and casements, if a very simple shelter for dolls and furniture will suffice. With the exception of shingles, chimney and trim, construction is of $\frac{3}{8}$ -in. plywood throughout. Use only the best grade, sand-papered on both sides. Both front and back are detachable, Figs. 5 and 7, to give access to the rooms on each side of the house.

Walls and Partitions: Exact sizes of walls and floors are shown in Figs. 3, 4 and 6. First, second and attic floors are identical except for the stair-well cut in the second. Front and back are the same size, and if you care to go to the additional work, windows and a door may be cut in the back, to correspond to those in the front. To

standardize the work, the first and second floors are made the same height, although in full-size houses the second floor ceiling is usually lower than the first. Dimensions and location of the partitions are given in Fig. 6. Each partition has its individual letter to make it easier to follow assembly.

Assembling the Structure: The cut-away perspective drawing, Fig. 3, gives a clear picture of assembly of walls, floors, roof, cornices, etc. It is important that all walls, etc., be as square as possible. Join them with No. 3 flat-head screws after having applied casein glue to the joints. The screws should be countersunk. Note that upstairs partition "D" is directly over partition "B," hence it is impossible to put screws into both. The choice is given to the lower partition, with casein glue for the upper, aided by the weight on this member. Roof supports, "G" and "H" set down inside the cornice, and the chimney is not installed until the roof, before shingles are laid, is on. Cornices at the ends are slightly different in section from those in front and back, Fig. 8. This is due to the detachable front and back walls, which fit into a shallow rabbet along the top. The plywood roof rests directly upon the

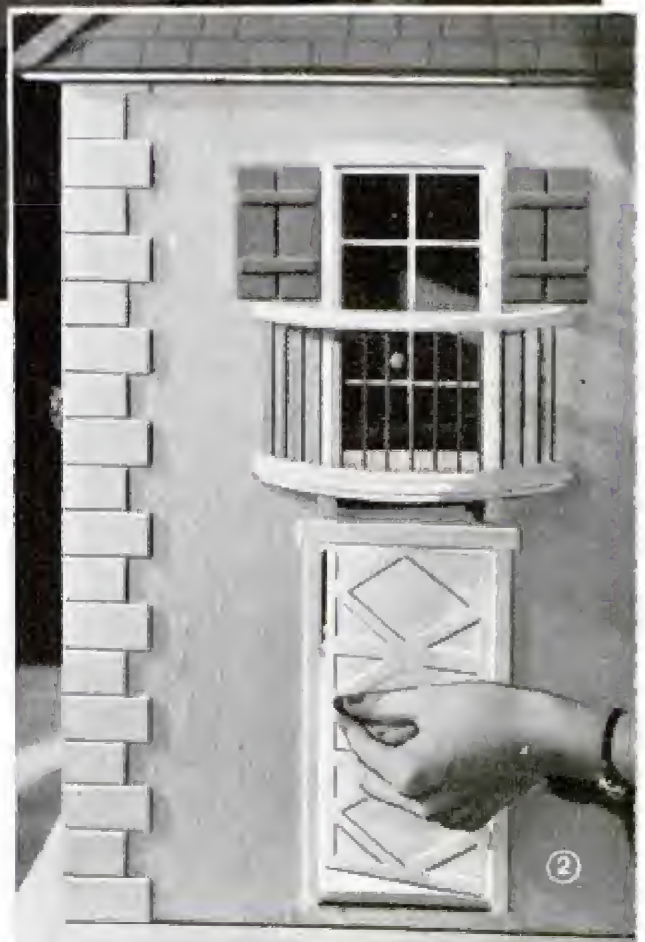
Christmas DOLL HOUSE



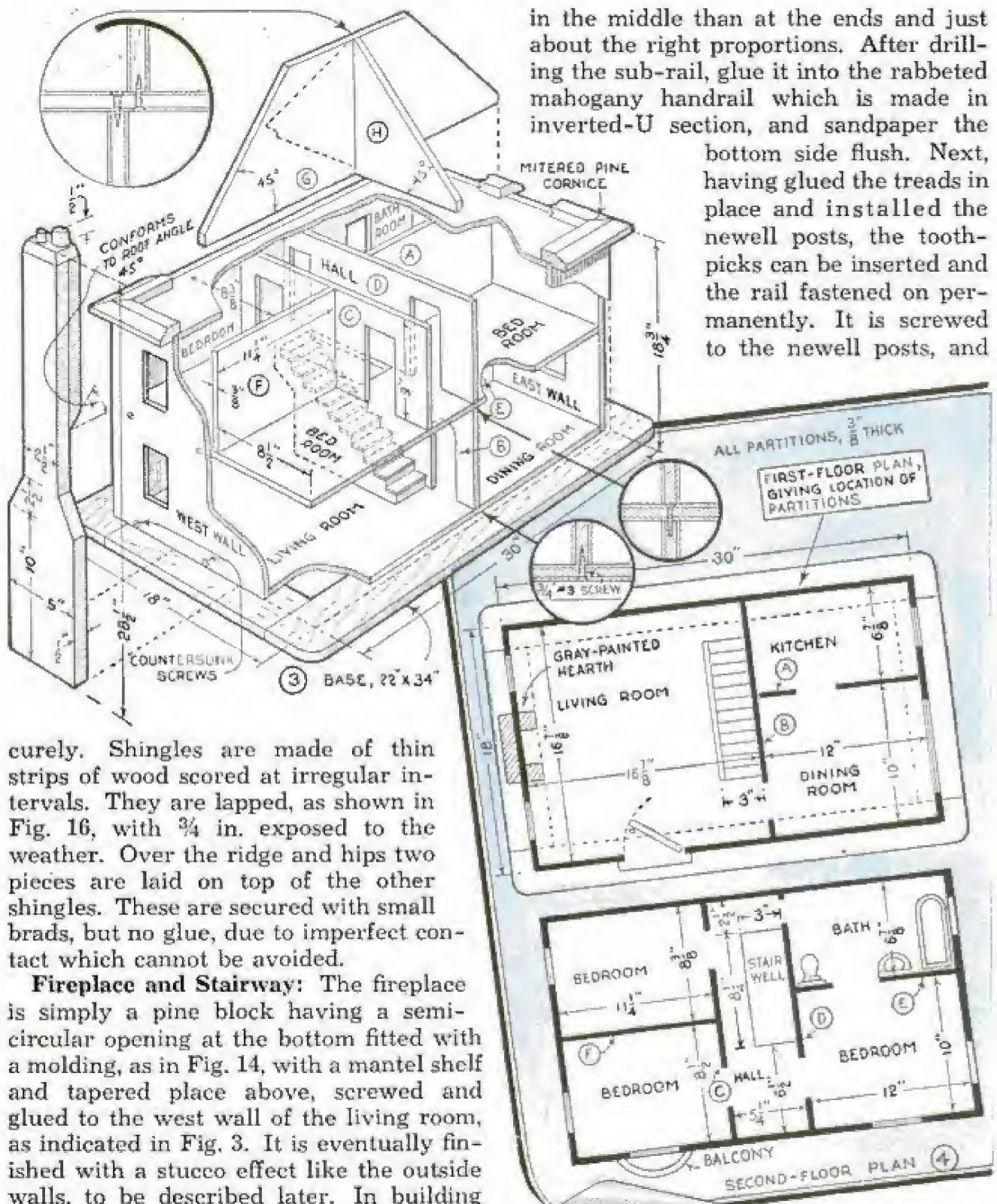
cornice, and is screwed down upon the supports "G" and "H."

Detachable walls swing out from the bottom, and no catch is provided to hold them in as such devices are troublesome for very small children. Instead, a thin strip of rubber is cemented at each end on the lower corners. These tend to hold the wall in the proper position. Exact dimensions of the four pieces of plywood composing the roof sheathing are given in Fig. 16. These are beveled along the edges on the underside, taking a 45-degree angle along the horizontal edges, and less at the hips. It is inevitable that some trimming will be necessary at the latter joints unless one can cut the plywood "geometrically perfect."

For the imitation stone work on the corners of the building, scroll-saw a thick piece as shown in Fig. 7 with 1-in. notches $\frac{1}{2}$ in. deep. Then rip it into $\frac{1}{16}$ -in. strips. These in turn are lightly scored with a circular saw to indicate mortar joints between



the blocks. Note that to preserve the same proportions on front and side walls, a strip the width of the plywood is ripped and glued to the edge. In gluing pieces together, it is understood that the wood is unpainted. Otherwise it will not hold se-



curely. Shingles are made of thin strips of wood scored at irregular intervals. They are lapped, as shown in Fig. 16, with $\frac{3}{4}$ in. exposed to the weather. Over the ridge and hips two pieces are laid on top of the other shingles. These are secured with small brads, but no glue, due to imperfect contact which cannot be avoided.

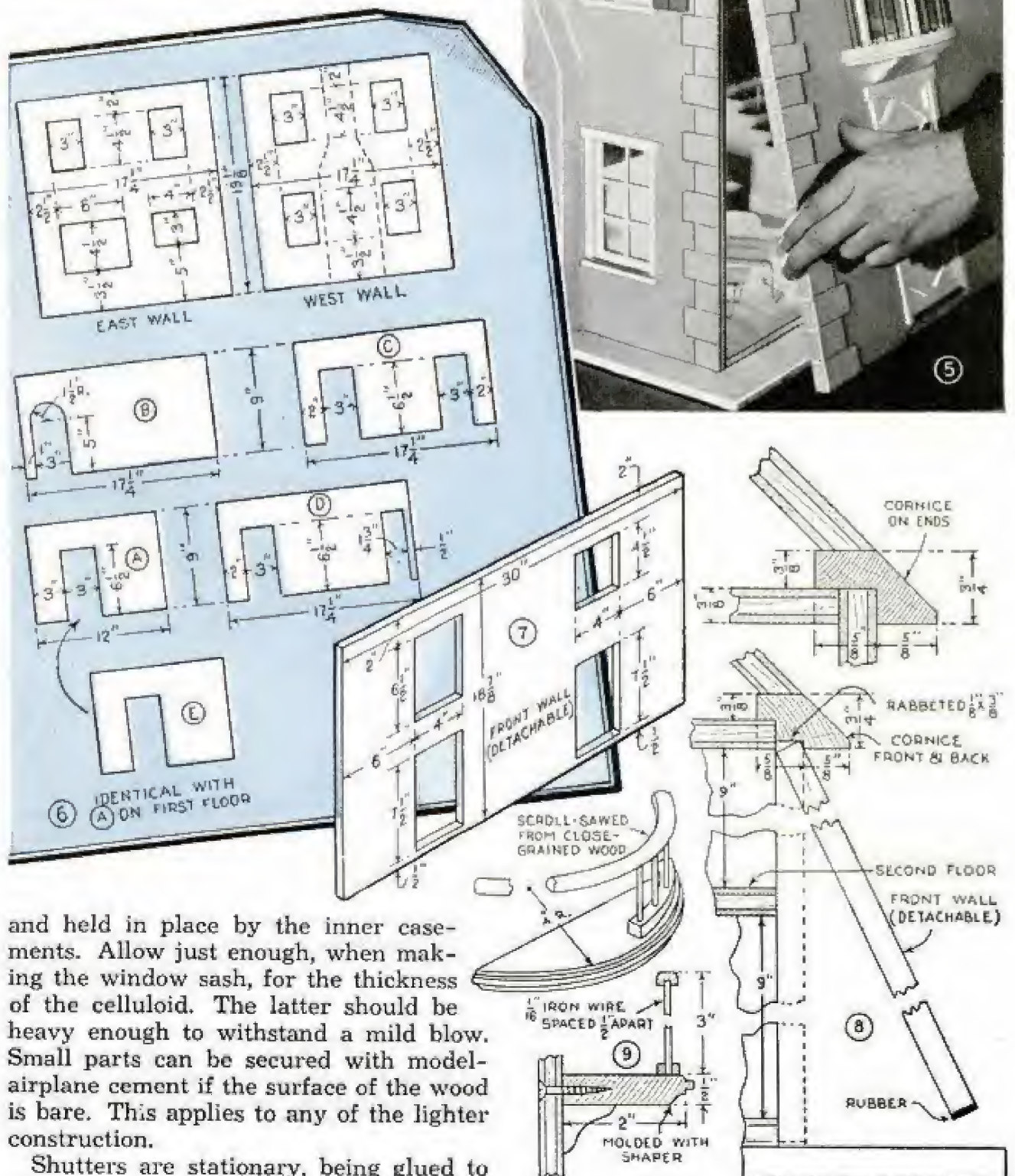
Fireplace and Stairway: The fireplace is simply a pine block having a semi-circular opening at the bottom fitted with a molding, as in Fig. 14, with a mantel shelf and tapered place above, screwed and glued to the west wall of the living room, as indicated in Fig. 3. It is eventually finished with a stucco effect like the outside walls, to be described later. In building the stairway, two side members are cut with the steps and joined with a piece of wood in between, as shown in Fig. 13. One wall is then screwed and glued to the partition "B." Before installing the stairway permanently, all the mahogany treads are made and an inner or sub-handrail is clamped over them, and each step is drilled through the latter for the spindle. Round, tapered maple toothpicks are just the thing for the spindles, as they are thicker

in the middle than at the ends and just about the right proportions. After drilling the sub-rail, glue it into the rabbeted mahogany handrail which is made in inverted-U section, and sandpaper the bottom side flush. Next, having glued the treads in place and installed the newell posts, the toothpicks can be inserted and the rail fastened on permanently. It is screwed to the newell posts, and

wood plugs are set over the countersunk screw heads. Before final assembly, all the white painting should be completed on the stairway walls and spindles, and mahogany treads and rail stained and shellacked. Construction of the stairway leaves a handy coat closet underneath, reached through a door in the rear.

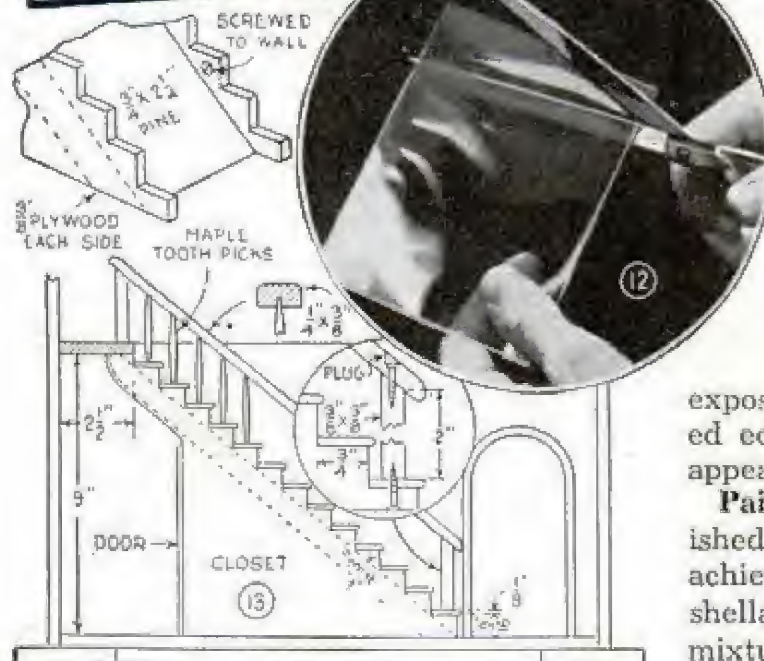
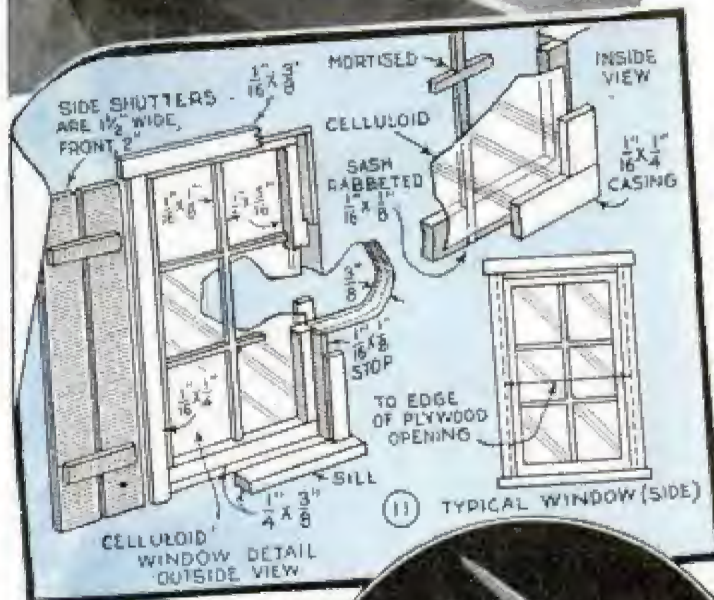
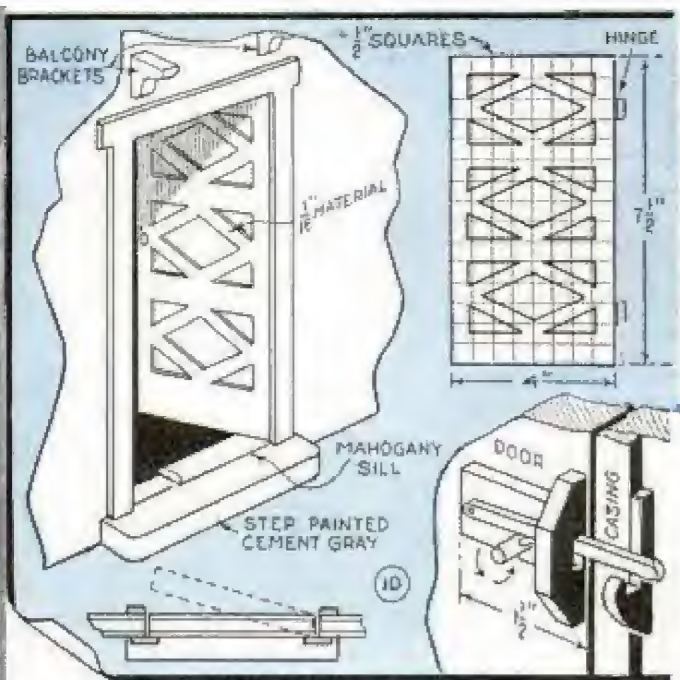
Windows, Doors and Balcony: The original doll house shown in the illustrations

is fitted with complete sash and celluloid panes, a typical example being illustrated in Fig. 11. First a stop-batten is set inside the window opening and glued to the plywood. Casement pieces are lapped flush over this on the outside and a sill installed as shown. The sash is made of pine with the mullions rabbeted into the side, top and bottom members and mortised together where they cross. This makes the entire inner side flush and ready to receive the celluloid pane, which is cut as in Fig. 12



and held in place by the inner casements. Allow just enough, when making the window sash, for the thickness of the celluloid. The latter should be heavy enough to withstand a mild blow. Small parts can be secured with model-airplane cement if the surface of the wood is bare. This applies to any of the lighter construction.

Shutters are stationary, being glued to

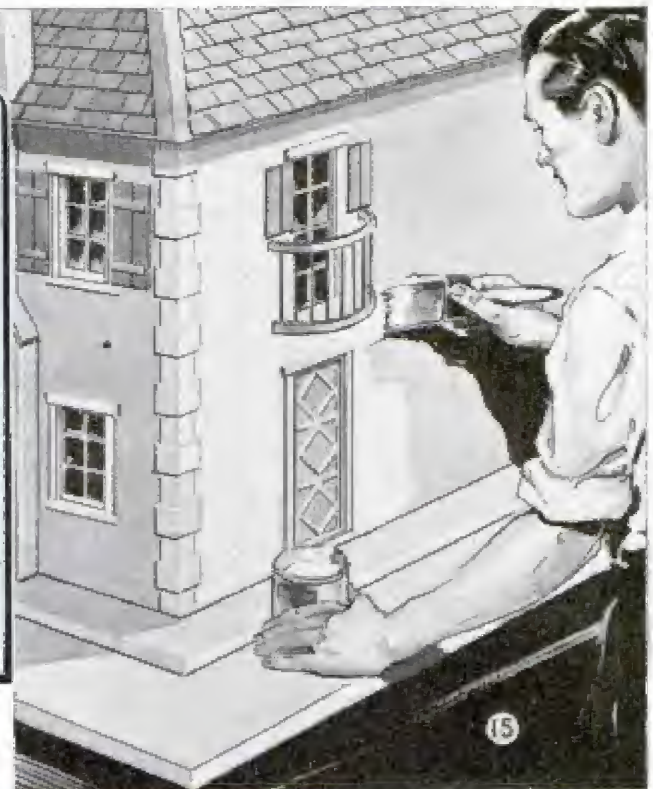
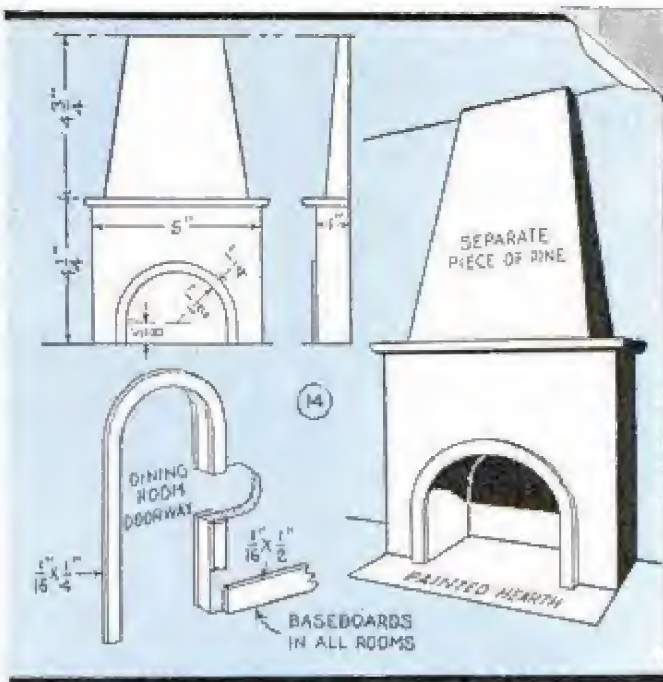


cleats secured to the house walls. The doorways between rooms are fitted with frames or trim, as in Fig. 14, and a neat baseboard is also installed in each room. The front door is hinged and swings inward in the standard arrangement, and is fitted with an all-wood latch operated from either side of the door, Figs. 2 and 10. The front of the door, which is plywood, is decorated with thin strips laid in the pattern of the squared diagram. A mahogany sill adds much to the realistic effect. In making the lock, see that all parts are loose enough so that the addition of paint will not cause them

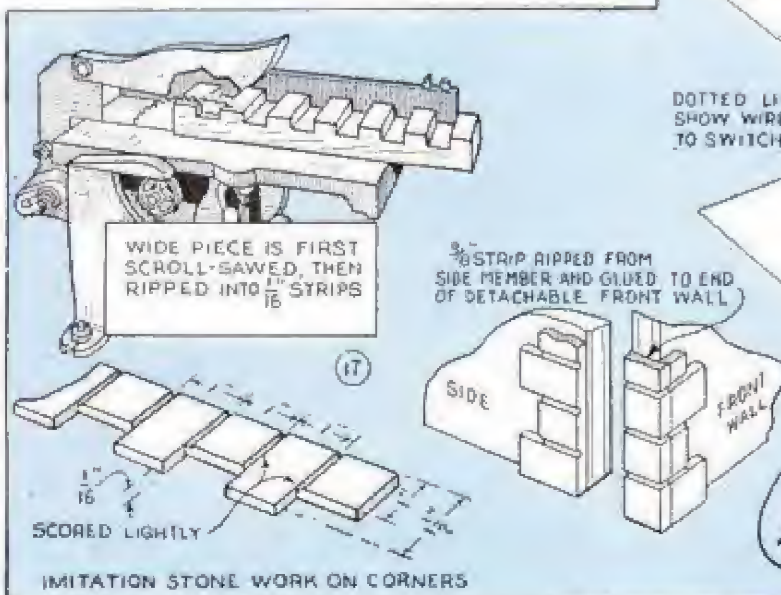
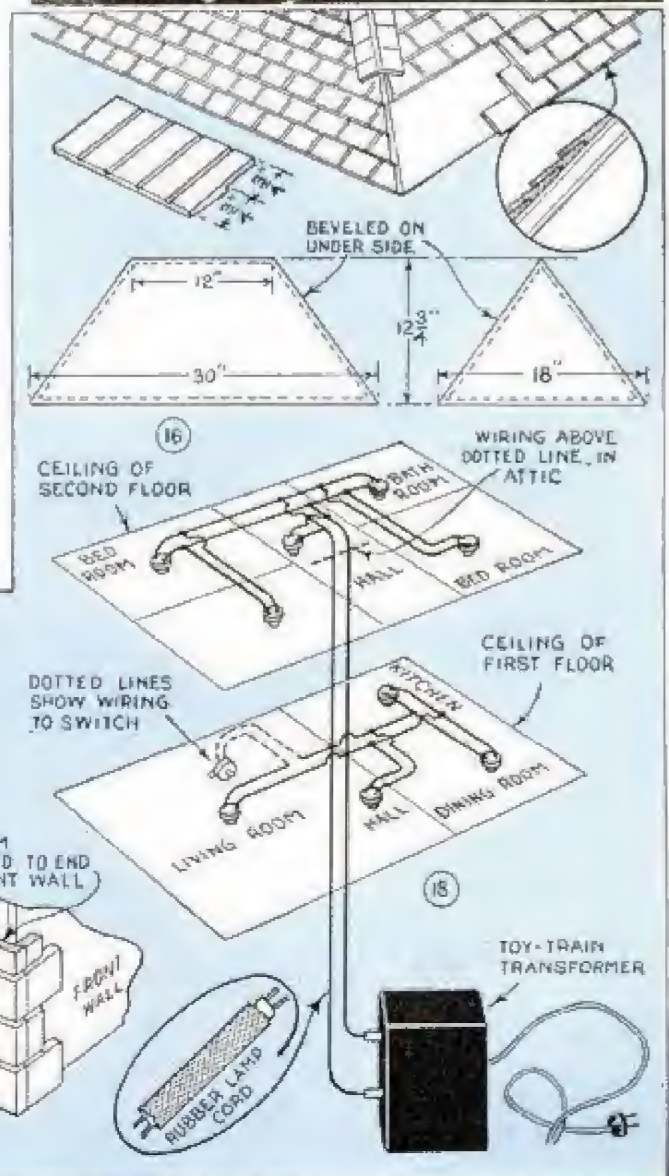
to bind. A substantial balcony over the door is simply made as in Fig. 9, and has a very pleasing effect. It is a curved base with handrail and iron spindles. The rail and corresponding piece at the base are scroll-sawed and clamped together for drilling. This work is done with the pieces reversed, that is, the upper rail on the bottom so that it can be drilled only half-way through. Thus no holes are

exposed when the rail is in place. A molded edge to the balcony base adds to its appearance.

Painting: The original doll house is finished to resemble stucco, and this is achieved by painting with a mixture of shellac and dry plaster, Fig. 15. When the mixture has hardened, it is gone over with



paint of whatever color you select. In this case, cream. The corner blocks are French gray; the roof green. Interior woodwork is white, with all walls papered. The paper was taken from a sample book, which cost nothing. For paste, a mixture of flour and water and a little alum was used. Window casements and balcony are white, with the spindles of the latter black. Floors are shellacked in natural wood, with oilcloth on the kitchen to resemble linoleum. If desired, electric lights can be installed as in Fig. 18, using a toy-train transformer and small, rubber-insulated wire. Tiny lamps and sockets for model-railroad installations are used in wiring the house.

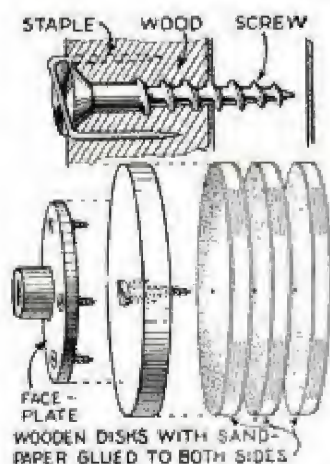


Temporary Signs Held on Trees with Sections of Auto Casing



If you want to fasten a few temporary signs to trees, you can do it by using sections of auto casing as clamps. These are nailed to the sign as indicated in the detail and have enough resiliency to grip the tree or other support without damaging it. When the signs are to be removed, just pull them off the supports.

Abrasive Surfaces on Disk Sander Changed Quickly



Amateur craftsmen who have small sanding jobs that require different grades of sandpaper, will find this lathe sander a timesaver as it has several quick-change abrasive surfaces. It consists of three or four wood disks, one of which is

screwed to a faceplate. This disk has a wood screw projecting from its center for quick attachment of any one of the other

disks, which are faced on both sides with abrasive paper of different grits. The screw is kept from turning by a staple driven into the wood so that it straddles the screw head and rests in the slot.

—Harry S. Hayes, St. Paul, Minn.

Keeping Ants Out of Lunch Box

If you have had ants get in your lunch box, here is a hanger that will keep them out. It is nothing more than a length of heavy wire with hooks bent on both ends and a compression can lid soldered in the center. After you hang up the box as



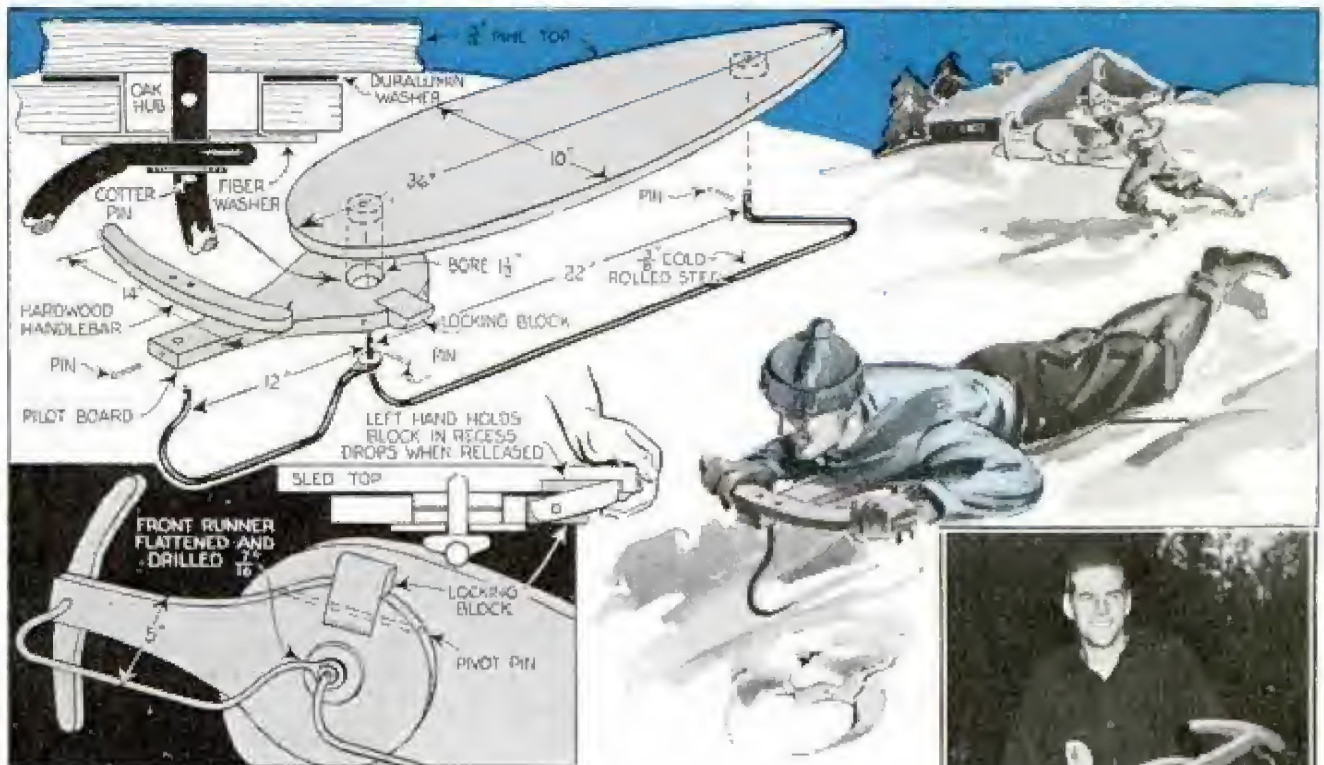
shown in the photo, fill the can lid with water. If ants crawl down the upper part of the hanger, they will not cross the water to reach the box.

Yarn Is Wound over Clothespins Clipped to Ruler

It is unnecessary to use the back of a chair for winding or measuring yarn into suitable skeins. A simpler method is to clip three clothespins on a wooden ruler as shown, the center one serving as a handle.



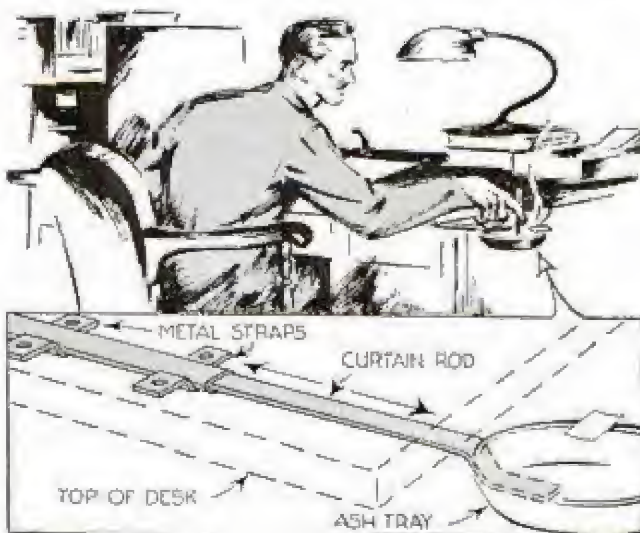
Trim 'Mono Coaster' Has Articulated Runner



Designed for high speeds, this sled with its articulated forward steering runner is easy to maneuver. It steers and balances similar to a bicycle and is equipped with a simple steering-gear lock, which holds the runner straight ahead when the rider wishes to run and flop onto the sled while in motion. The sled is made unusually light without sacrificing strength, and it can be tucked under the arm for carrying. The top is a piece of white pine, oak or other hardwood being used for the pilot board and handlebar. Note that the rear end of the front runner is flattened and drilled to slip over the forward or pivot end of the rear runner. By drilling the hole $\frac{1}{16}$ in. oversize, a fair amount of play is permitted to take up some irregularities of the hill.



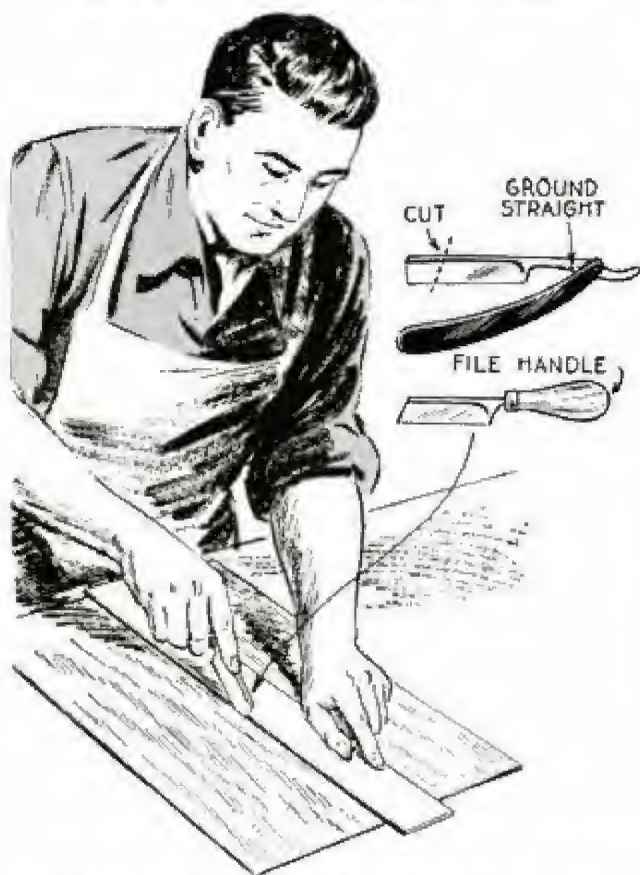
Ash Tray Fastened to Curtain Rod Slides under Desk Top



The inconvenience of having an ash tray on a desk while working is overcome by attaching the tray to a short section of telescoping curtain rod. This permits the tray to be pulled out when needed and pushed out of the way when not in use. The larger section of the rod is held in place by metal straps as indicated.

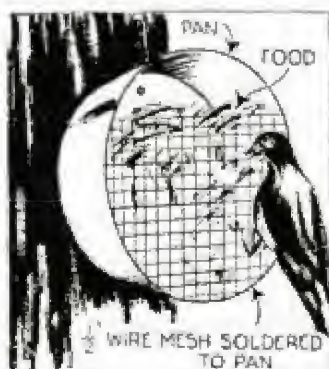
☞ To be effective against moths, it is necessary to keep cedar closets, chests and other containers for woollens tightly closed against possible entrance of the insects. Also, articles to be stored must be cleaned first to make sure they contain no eggs.

Sheet Veneer Is Cut Smoothly with Straight Razor Blade



Altering the blade of a discarded straight razor as indicated, and fitting it firmly in an old file handle makes a knife for cutting sheet veneer. After removing the blade from its handle, the end is broken off by placing it upright in a vise and striking it a sharp blow with a hammer, after which the severed end is ground to a bevel. The opposite end is ground straight to fit in the file handle.

Pan Nailed to Tree Trunk Is Good Bird Feeder



Desiring an inexpensive bird feeder of large capacity, one farmer nailed a pan to a tree and then soldered $\frac{1}{2}$ -in. wire mesh over the top as indicated, leaving the upper portion open so that the food supply could be replenished. The feeder was kept filled with wheat heads. After picking the

wheat grains from the heads, the birds pulled the empty ones through the wire and dropped them so that they could get at the filled heads.

Tax Tokens Kept in Ball "Purse"

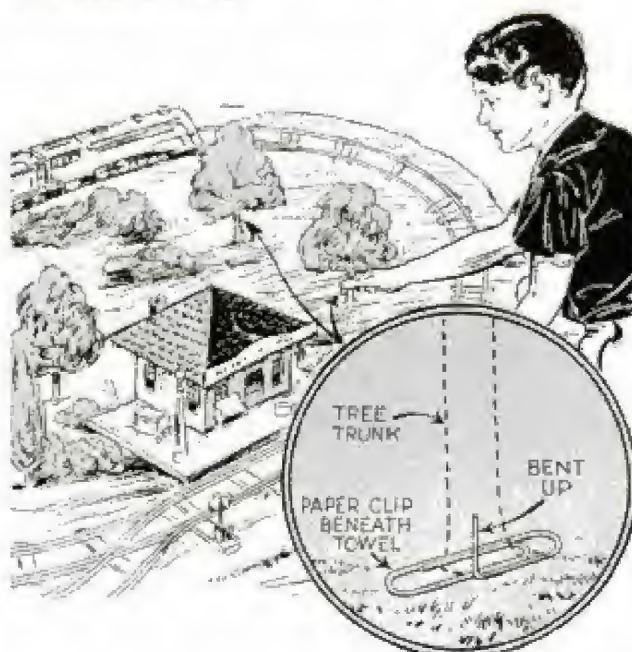
Shoppers in states where tax tokens are used will find this purse handy for the tokens as it keeps them from being mixed with small change in the pocketbook. The



purse is merely a hollow rubber ball slit along one side and a string attached for tying it to your shopping bag. To open the purse, squeeze the ball at the ends of the slit. When not in use, the ball is dropped into the bag.

Support for Miniature Trees

When making miniature scenery for model railroads, window displays and other purposes, a turkish towel stained green serves nicely as a lawn. To support miniature trees and shrubs firmly on such a lawn, one of the simplest methods is to use paper clips with one end bent sharply upward. This end is pushed through the towel and then into the stem which is to become the tree or shrub. The clips are out of sight, have a broad area and hold the trees firmly.





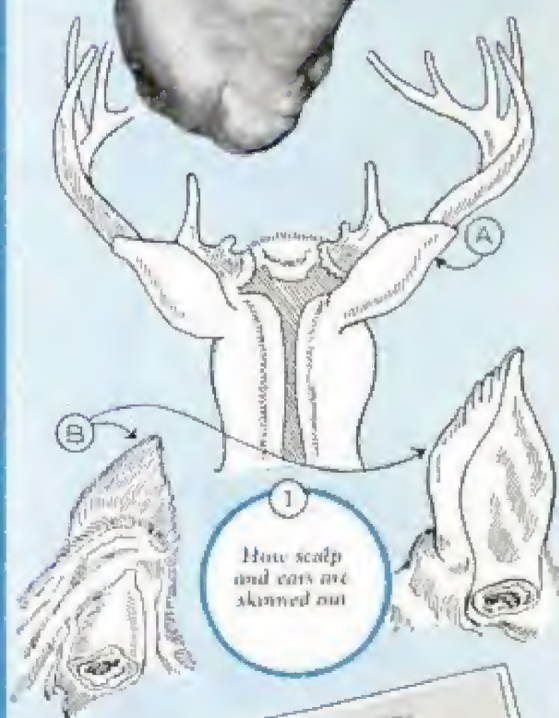
MOUNT *that* TROPHY *for your Den*

By John William Moyer

Staff Taxidermist
Field Museum of Natural History

AFTER you have finally secured a fine head from an elk, deer, or moose, why not mount it yourself? Like many other undertakings, the actual work of mounting a game head is much less difficult than it might appear in the beginning. The procedure is really very simple but you have to take special care with certain details. There are two methods you can follow and both are described here.

To begin with, do not allow the head to lie any longer than absolutely necessary before skinning, or the hair will slip. Get the carcass into a cool place and skin out the head without delay. In cutting the scalp from the body skin, be careful to leave the neck as long as possible and with a part of the brisket attached. After the head and neck have been severed from the carcass, removal of the scalp is begun by



How scalp
and ears are
skinned out



Here the scalp is shown with both
hairs and flesh sides on



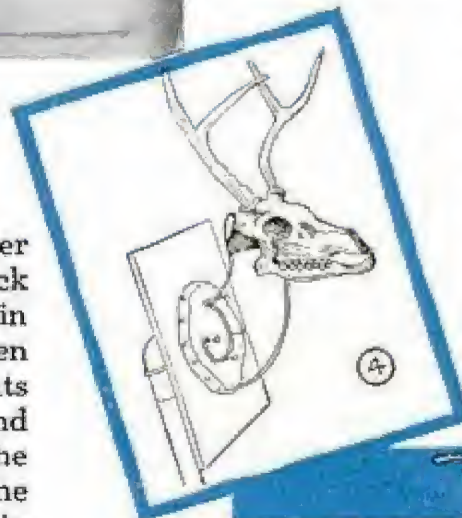
After skinning, the head is immersed in boiling water, which loosens remaining fragments of flesh

skinning directly up the center of the back, or nape, of the neck to the base of the skull as in the upper detail, Fig. 1. Then you make short branching cuts to the base of each antler and work the skin away from the top of the skull. Skin out the neck, and in removing the skin down over the face, use care around the ears, eyes, lips and nostrils. Cut the ears from the head, close to the skull and do not split open the eyelids any more than they are. The skin is then cut away from the skull, being very careful in separating it from the jaws and teeth. After the skin has been removed, the ears, Fig. 1 A, will have to be skinned out and the nostrils and lips split open. Do this now, or the salt will not act upon this part of the skin. In Fig. 1, details B show how the ears are skinned up the back to the tip to remove the cartilage. The latter is kept

and used later as a model for the artificial ears. Salt each ear thoroughly and turn it right side out. To produce a first-class job on any game head, the skin, or scalp, will have to be tanned. One can ship the scalp to a professional tanner, or can do the job himself by following directions given in the article on tanning in a previous issue. Fig. 2 shows the hair and flesh sides of a scalp after being removed from the skull and made ready for salting. Use common salt and see that all parts are well covered.

Cut away all muscles, eyes, tongue, brain, etc., from the skull, leaving only the antlers attached. Now place the entire skull in a tub of boiling water which will loosen the remaining flesh, allowing it to be removed very easily, Fig. 3. With a small piece of wire, fasten the jaws together, after all flesh has been cleaned from the skull.

Cut out a base roughly to the shape and size of neck from a 1-in. piece of wood and fasten the skull to this with two iron rods, as shown in Fig. 4. Allow the rods to hold the skull in the position wanted in the finished head. The head and neck can be straight or turned as desired. Cut and bend the rods to the same length as the neck skin. Now, with coarse excelsior, you build up a form on the rods and skull to model over. This is done by wrapping the excelsior around the neck



Neck is wrapped with excelsior to give the rough shape

and binding with heavy twine, as in Fig. 5. Keep this form smaller in size than the original head. Using fine-grade papier-mache, model over the rough form all of the muscles and other anatomy of the head you are mounting, Fig. 8. Build this up, layer by layer, to the correct size and shape. It may be necessary for you to study photographs, drawings and zoo animals to get this correct anatomy. Allow the mache to set and dry thoroughly, then shellac. This done, the modeled form is now ready for the tanned skin. Cut a pair of artificial ears from a piece of perforated lead, using the ear cartilage for measurements. The artificial ears can be fastened to the form, or inserted in the ear pockets of the scalp, using thin papier-mache to cement the skin to the ears. The scalp, after it has been tanned, is relaxed with warm, soapy water, to which carbolic acid has been added to the amount of $\frac{1}{2}$ teaspoonful to the gallon, Fig. 7. Brush well over the scalp and roll up, flesh



Finally, the scalp is drawn in place and sewed down the back of the neck



Modeling with papier-mache brings the head back to life-like form

side in, until pliable. It is now treated with a paste made by mixing arsenic powder (poison) with alcohol to a thin consistency. This prevents damage by moths and other insects.

The next step is to cover the model form with a thin coating of papier-mache ready to pull the skin over. The mache allows the skin to be adjusted into place and also holds it when set. Thicker papier-mache is used to model out around the lips and nostrils and at the base of the ears, forming the ear pockets. Glass eyes, of the proper color and size, are set into the eye sockets and held in place with the mache. Adjust the ears to the angle wanted and hold in position with heavy wires. Now start at the base of the neck and sew the skin together, as in Fig. 6.

Allow the skin to dry thoroughly, after which the hair is well combed and brushed, Fig. 9. The skin around the eyes, lips and nostrils can be painted with oil colors of the proper shade, and the antlers are cleaned and



When scalp is dry the hair should be thoroughly combed and brushed



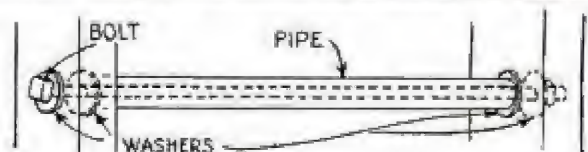
Ladder Rungs of Rods and Pipes Defy Weather and Hard Use

Make your ladder rungs of rods and pipes and severe climatic changes or hard usage will not affect them. Each rung consists of an iron rod threaded at both ends, or a long bolt slipped through a length of pipe. Large washers are placed under the nuts

oiled, using any light oil, rubbed on with a cloth and the surplus wiped off. Photo above Fig. 1 shows the completed head.

Now, if you wish to speed up the work of mounting your game head, there is another very satisfactory method. From any reliable taxidermy supply house, purchase what is known to the trade as a "head form" for the particular head you desire to mount. This head form is shown in Fig. 10. Be sure and send the correct measurements so the proper size form can be sent you. After the scalp is removed, saw off the antlers but leave them attached by a small section of the skull. They are now fastened to the head form, Fig. 11, with two screws driven into a small block of wood in the form. The latter is shellacked and the scalp, after being tanned and treated with the arsenic paste, is pulled over this form. Then the head, when thoroughly dry, is finished in the same manner as the one mounted by the first method.

Ⓢ Your vacuum cleaner will be more efficient if the dust bag is emptied often. Never wash the bag as this will remove the filler that makes the fabric dustproof.



and at both ends of each length of pipe to protect the wood sides of the ladder. If the rungs loosen, just tighten the nuts on the ends of the rods, which will pull up the rungs against the sides.

Box Underneath Bridge Table Stores Cards



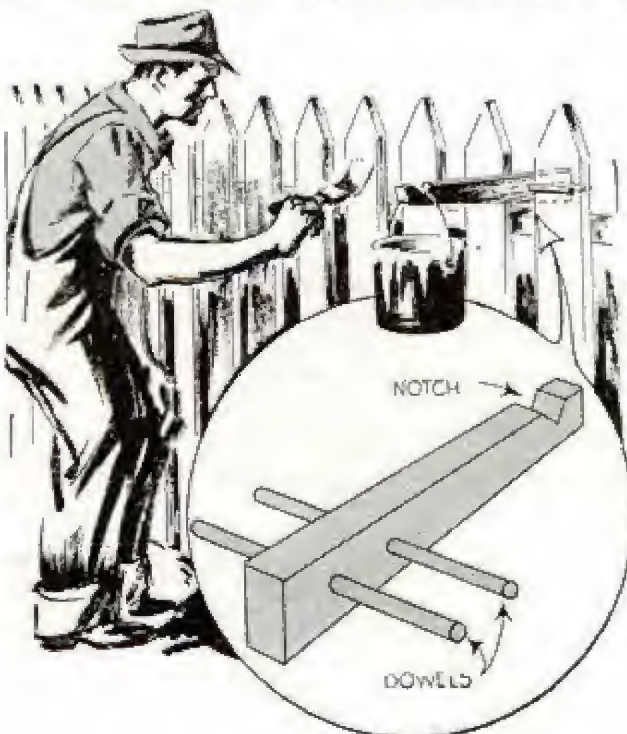
Cards, pencils, score pads, and ash trays are always at hand if you store them in a shallow box fastened to the underside of your card table as shown in the left-hand photo. It takes only a second to remove or replace the box as it is held between cleats by two short leather straps and a buckle, the ends of the straps being



fastened to the cleats with small nails. The box can be made easily from almost any kind of hardwood, and should be finished to match the finish of the table.

Simple Bracket Supports Paint Bucket on a Picket Fence

The inconvenience of stooping to dip his brush in a bucket of paint while finishing



a picket fence was avoided by one man who made this removable bracket to support the bucket at a convenient height. The bracket consists of a length of wood with two dowels projecting from the sides at one end, the dowels being spaced to straddle two of the pickets as indicated. A notch near the free end of the bracket takes the bucket handle.

Wood Shield on Scriber Point

To protect the fine point of a scriber from becoming broken or dulled when not in use, make a small cap from a piece of soft wood. Drill a small hole part way through the cap from the small end so that it is a snug fit on the scriber.—Horace Taylor, Anderson, Ind.



Office Stapler Fastens Paper on Sanding Drum



Here is an easy method of fastening sandpaper on softwood sanding drums. A V-groove is cut along the length of the drum and one end of the paper is fastened into this with a stapler of the type used in offices. Then the paper is wrapped around the drum and the other end is fastened. The paper should be wrapped in the direction opposite to that the drum rotates.

—Howard R. Heydorf, Missoula, Mont.

Park Incinerator Resembles Stump



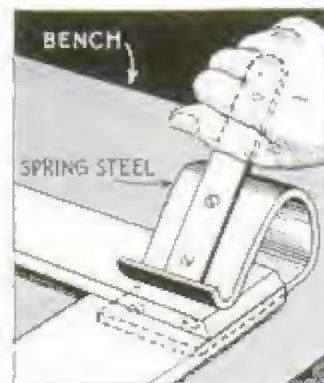
Getting away from the usual square metal or concrete incinerators, the park officials of one city made a number of concrete incinerators that resemble hollow tree

stumps. To make the incinerator, an oil drum was first placed in the designated spot and loosely wrapped with fine poultry wire. Then several straight sticks were inserted between the netting and the drum and concrete mixed rather dry was packed

between the drum and sticks. After the concrete had set, the sticks were removed and the drum lifted out. Then the inside of the wire was plastered with cement and a hole was made on one side at the ground line for draft. The sticks formed deep grooves in the outside of the incinerator to resemble bark.

Spring Clamp on Bench Top Grips Thin Work

I find this rugged spring clip handy for holding thin work while gluing or assembling it. The clamp consists of a piece of spring steel bent to the shape shown and screwed to the bench top. A handle for opening



the clamp is attached with small bolts as indicated.—C. H. Willey, Penacook, N. H.

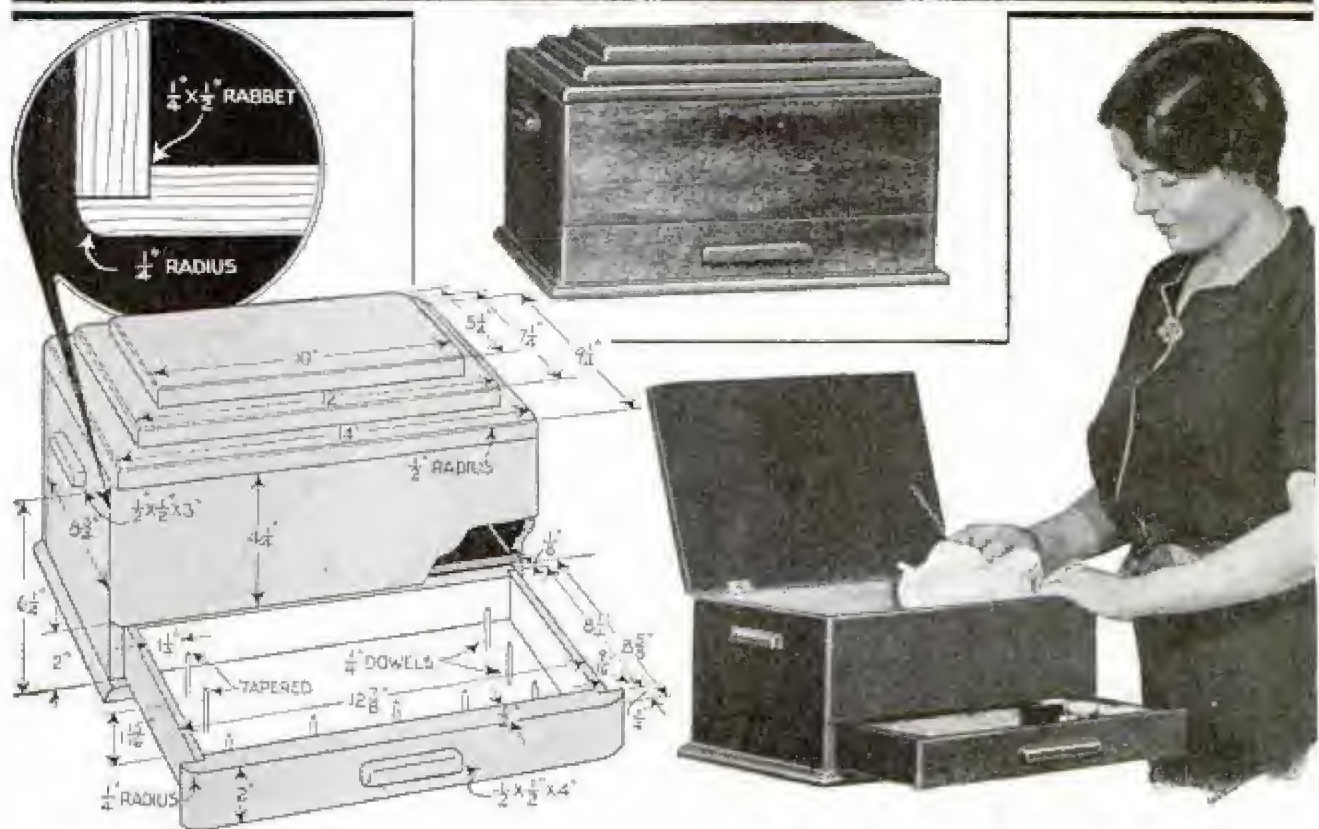
Stiff Swing Seat for Children

For little tots who find it difficult to balance themselves on a rope swing, two pieces of wood shaped and screwed to the seat bottom as shown will keep the latter from tipping. The top ends of the wood pieces are attached by driving large-headed nails through the rope, as indicated.

—August Blume, Huntingburg, Ind.



Step-Top Sewing Box Has Drawer for Thread



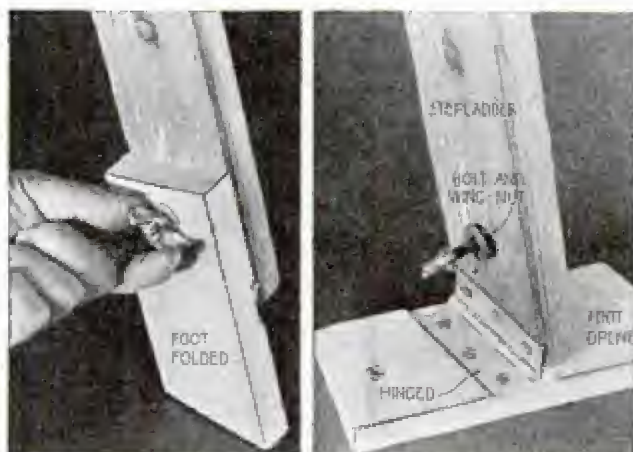
This sewing box is equipped with a compartment for holding fancy work or small pieces, and a shallow drawer in which spools of thread may be kept in orderly array on pegs. Mahogany is the best material for its construction, although any figured hardwood is suitable. The ends of the box fit into rabbeted sides and are grooved to take a shelf. After the edges of

the bottom have been rounded, the latter is fitted and nailed on. The lid and two step boards are rounded on the upper edges and the assembly is fastened to the box with small butt hinges. The drawer fits the opening with a clearance of about $\frac{1}{16}$ in. at the ends and top. Projecting ends of the drawer front form lips, which act as stops and give a neat appearance.

Hinged Wooden Feet Support Stepladder on Soft Ground

To prevent a stepladder from sinking into soft ground, fit the legs with folding feet of the type shown. These are made of

$\frac{3}{4}$ -in. wood of the same width as the legs. The feet are about 7 in. long and are fastened to the legs with strong hinges, the centers of the feet being recessed to take the hinges, which are fastened along the bottom of the legs. When not in use, the feet are folded back against the legs where they are fastened with $\frac{1}{4}$ -in. carriage bolts and wing nuts. The lower ends of the legs are then cut at an angle to set squarely on the floor. When folded down, the feet provide a firm base for the ladder on almost any surface.



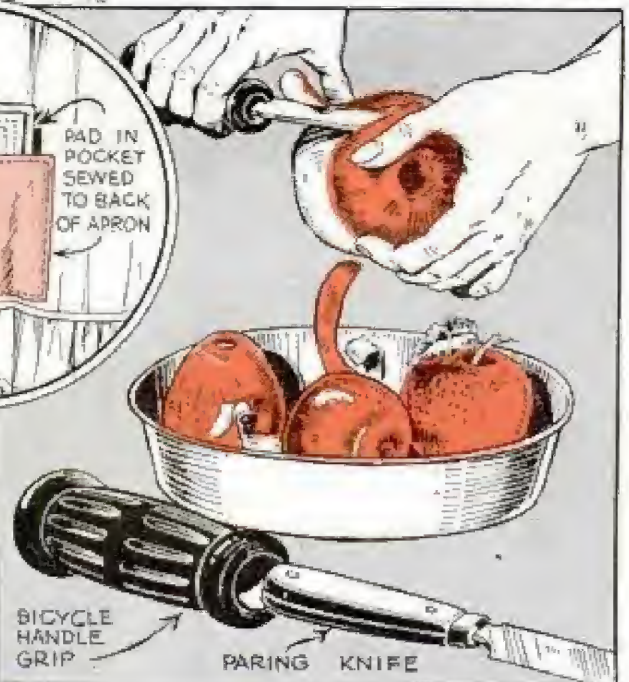
☞ To make your French-fried potatoes crisp let the raw potatoes stand in cold water for at least half an hour before frying.

Solving HOME



PAD IN
POCKET
SEWED
TO BACK
OF APRON

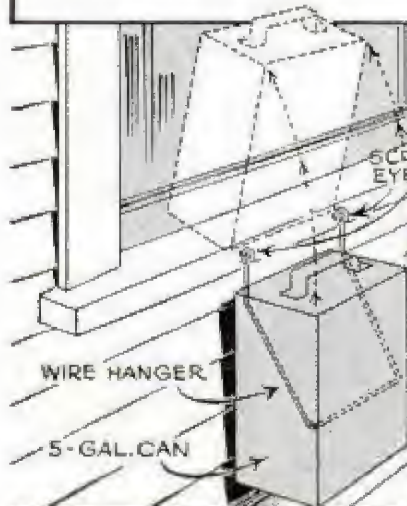
One housewife keeps a pad for lifting hot pans in a pocket which is sewed to her apron at the lower corner as above. An oil can cut as indicated below and hinged to a window sill serves as an outdoor cupboard for milk. It can be taken in through the raised sash



BICYCLE
HANDLE
GRIP

PARING KNIFE

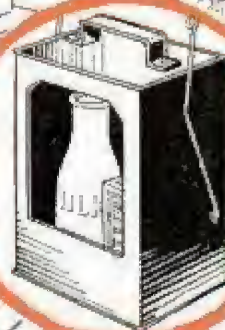
When you have a lot of paring to do, slip a bicycle handlebar grip over the knife handle to reduce strain on the hand



SCREW
EYES

WIRE HANGER

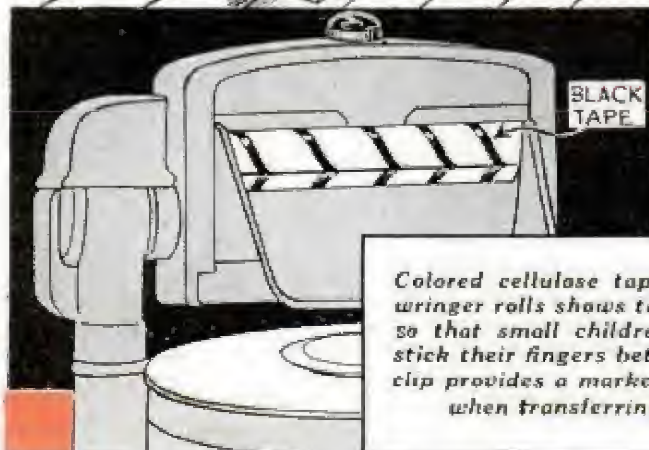
5-GAL. CAN



TACK SOLDERED TO
BOTTOM CENTER

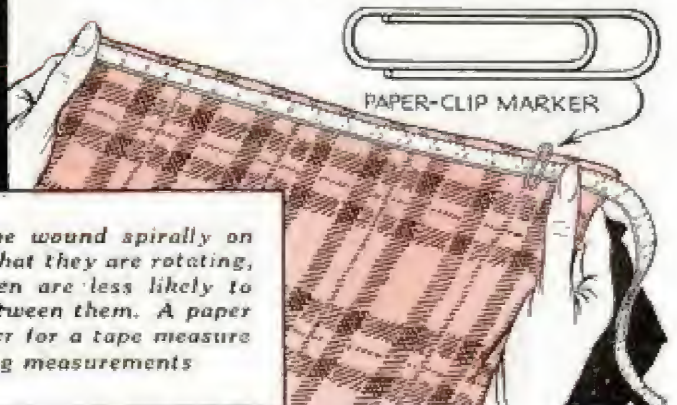
CAKE TIN

A cake tin with a tack soldered to the bottom provides a "merry-go-round" holder for packages kept on a shelf. It can be turned to bring the desired article in front



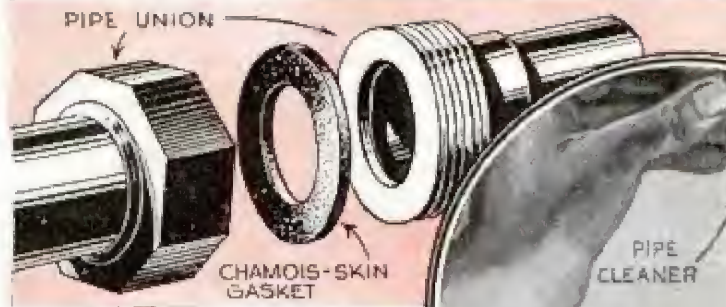
BLACK
TAPE

Colored cellulose tape wound spirally on wringer rolls shows that they are rotating, so that small children are less likely to stick their fingers between them. A paper clip provides a marker for a tape measure when transferring measurements



PAPER-CLIP MARKER

PROBLEMS



Leaky pipe unions of the type shown above can be repaired with a gasket cut from chamois skin. Make the gasket hole undersize as it will stretch. If you suspect the presence of rats or mice in your basement, a couple of handfuls of flour sprinkled on the floor in one corner as below, will show their tracks



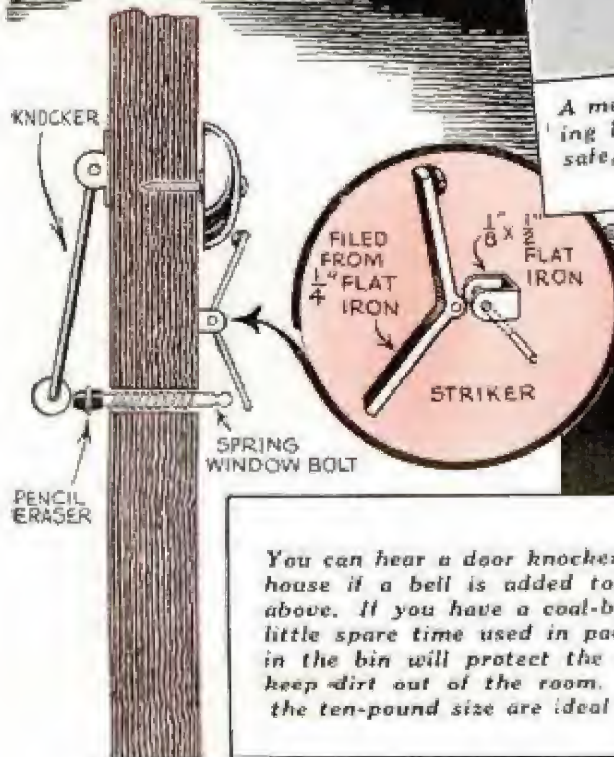
Instead of greasing the pin of a squeaky butt hinge, which may smear, dip a pipe cleaner in oil and with the pin out, swab the inside of the opening



A metal canopy from a ceiling light fixture provides a safe, decorative wall container for matches



Slip a hydrometer bulb over a smooth doorknob and you can turn it easily with wet hands



You can hear a door knocker throughout the house if a bell is added to it as indicated above. If you have a coal-burning heater, a little spare time used in packaging the fuel in the bin will protect the hands and help keep dirt out of the room. Paper sacks of the ten-pound size are ideal for the purpose



Short Pieces of Hose Provide Feet for Large Boxes



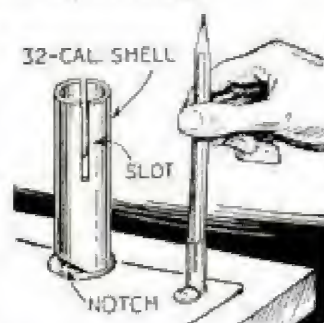
Fragile goods packed in large boxes can be protected against breakage from jars

and bumps by fitting the boxes with shock-absorbing feet. These are short pieces of garden hose cut on one side as indicated, and nailed to each corner of the box.

Thumbtack Puller on Pencil Made from Cartridge

A thumbtack puller that is always at hand on the end of a lead pencil is made easily from a 32-cal. cartridge that has been fired. The cartridge is

slotted at the open end and pressed together slightly so that it will grip the pencil firmly. Then it is notched along the rim at the lower end with a three-cornered file so that it can be pushed under a tack head easily. Tipping the pencil to one side pries out the tack.

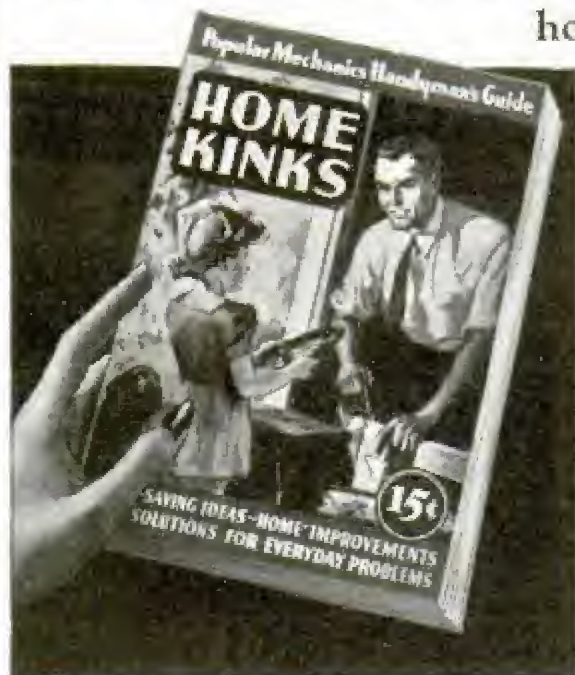


When tinting cloth be sure to hang it in the shade to dry. The basement will do if a shady spot is not available outside.

SAVE and MAKE MONEY by Knowing

how to solve everyday home problems

NEW REFERENCE GUIDE



for every practical home owner who wants simplified, usable information on making home repairs and improvements. Also shows many ways of reducing costs and eliminating waste. Contains complete details on refinishing floors and furniture; hanging wall paper; cutting heating losses; curing leaky faucets and making other minor plumbing repairs; protecting clothes, rugs and fabrics against moth damage; curing wet and leaky basements—all this besides numerous shortcuts and simple kinks of great value to make things handier around the average home

Write for "Home Kinks"—a copy will be sent to you upon receipt of 15 cents

Popular Mechanics Magazine, Book Dept., 200 East Ontario Street, Chicago, Ill.



Radio

POCKET-TYPE

Vacuum-Tube Hearing Aid

TINY radio tubes, little larger than a pencil in diameter and slightly more than 1 inch long, have recently enabled engineers to design a 4-stage vacuum-tube hearing aid, complete with crystal microphone, in a wearable container no bigger than a spectacle case.

Ordinary radio tubes have been used in table and group-type hearing-aid amplifiers with excellent results; now you can wear one that has sensitivity ample for operation under clothing, and only the ear piece is exposed to view.

The total electrical energy required is but a fraction of that necessary to operate the usual flashlight. The filaments of all four of these "Aurex-Ewing" type tubes together have a drain of just one-half that of a single type-199 "peanut tube" and, in spite of their tiny size, are claimed to have a useful life of more than 5,000 hours. A midget 45-volt B-battery is used. This has a compartment for the A-battery and is of handy pocket dimensions and weight.



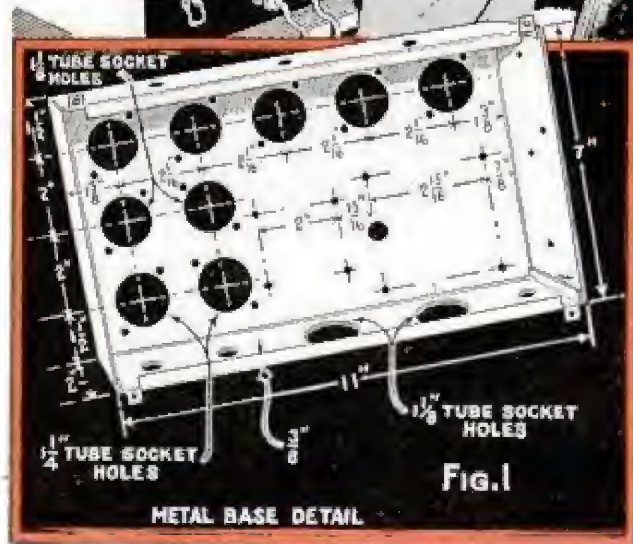
Aurex Corp., 1115

N. Franklin

How to build a PORTABLE

By Fred Dingman

PART I



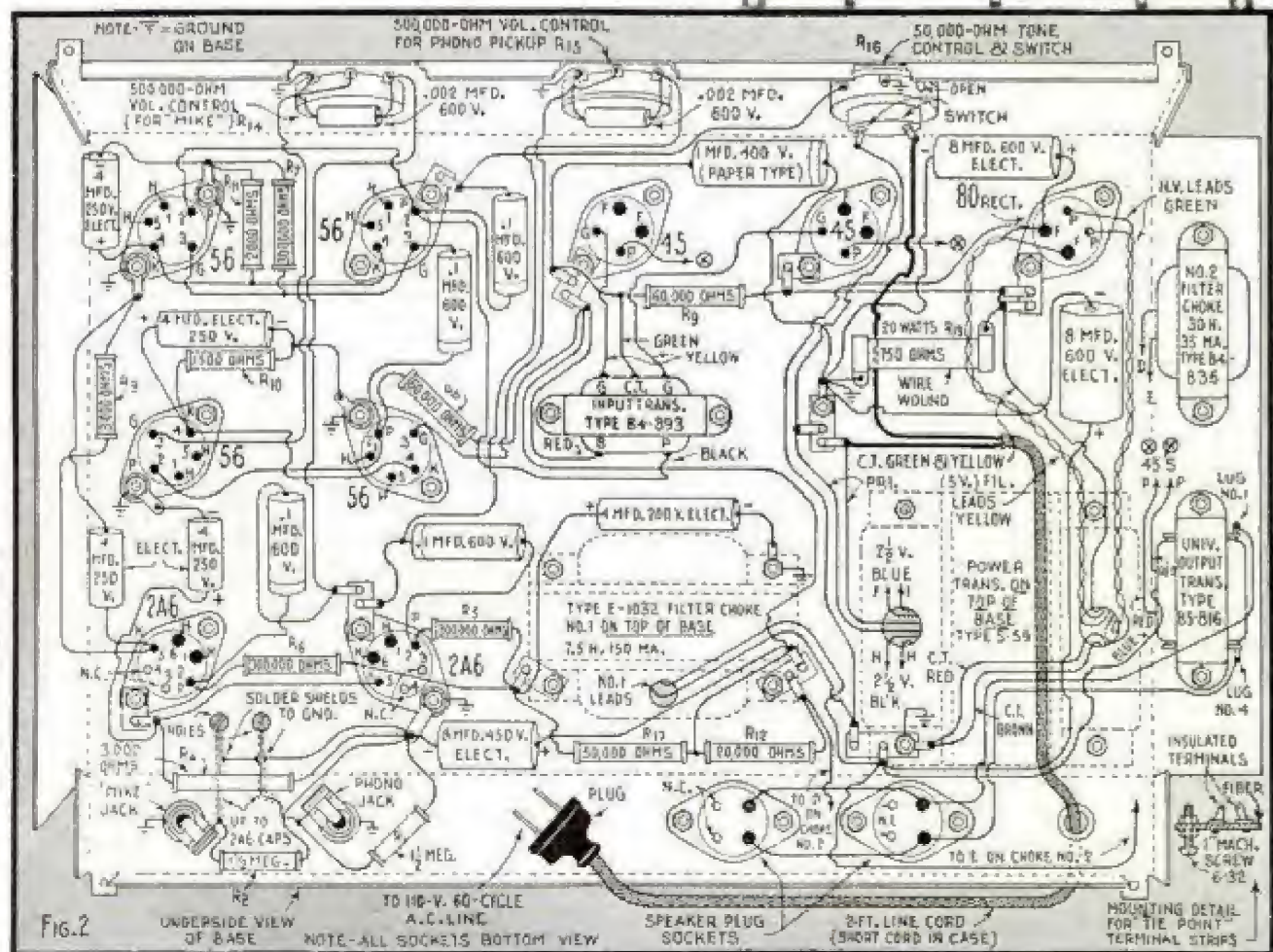
HERE is a "portable radio orchestra" that will bring you the world's finest dance music, when and where you want it. A complete 3-unit sound system suitable for fraternity and sorority parties, dancing clubs or lawn gatherings, it may also be used for public address and advertising. Operating two 12-in. permanent-magnet speakers with adequate volume for small halls or outdoor use, this general-purpose amplifier has an excellent undistorted output of about 10 watts.

Designed primarily as an inexpensive substitute for small dance orchestras at informal parties in a middle west university town, the builder supplies records and operator, and has had no difficulty in obtaining engagements

LOW-COST SOUND SYSTEM

for the sound system at reasonable rates. The original investment is about \$25, as all parts are inexpensive and the instrument and speaker cases are home-made. Circuit design is quite simple and strict adherence to the use of triode tubes insures excellent quality with a minimum of parts. A crystal or magnetic phono pickup may be used and the microphone can be a crystal, velocity or dynamic variety. Two input channels with separate control of channel mixing is possible, as individual gain control is provided for each channel. This is a distinct advantage, as music volume may be reduced for special announcements over the microphone. The phonograph motor used in the model is a "Green Flyer" type. However, any good phono motor of similar size may be employed. Construction details for the amplifier chassis base are given in Fig. 1.

(Continued to page 132A)



An Electrical Substitute for a Large Baffle

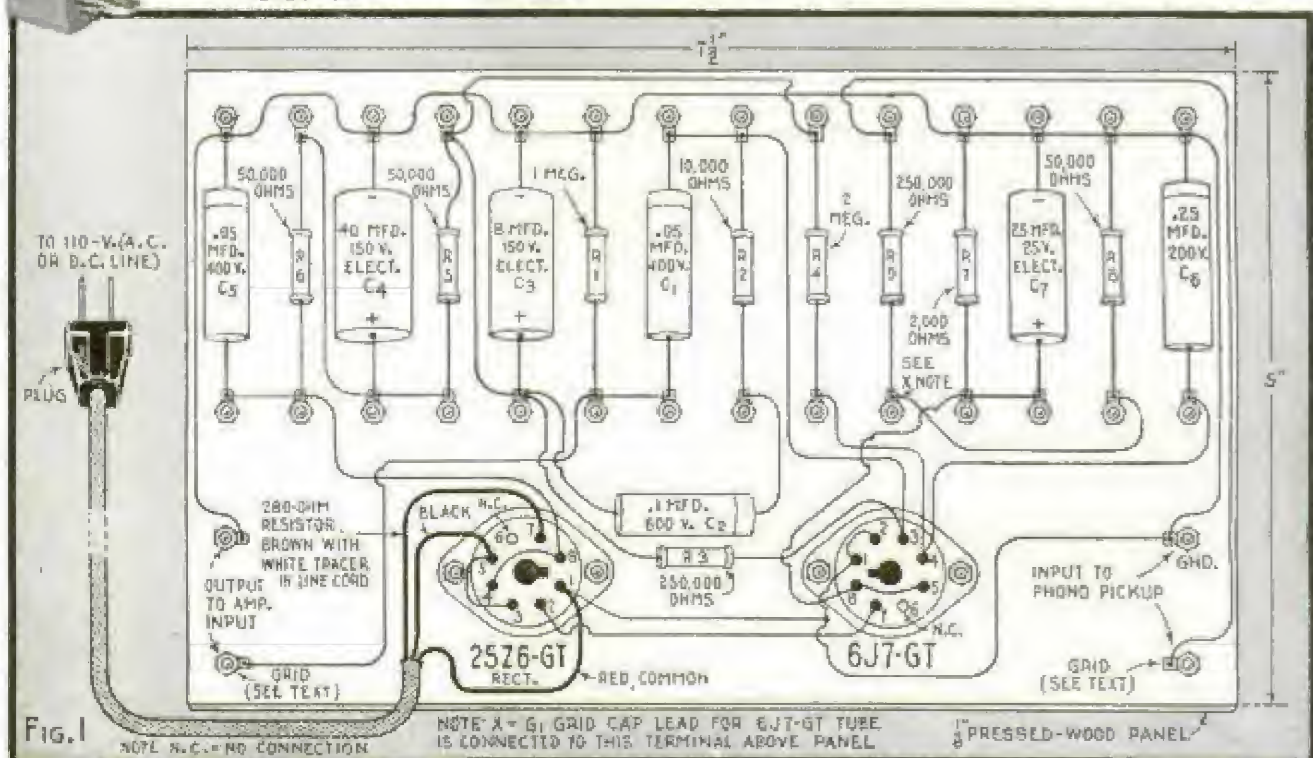
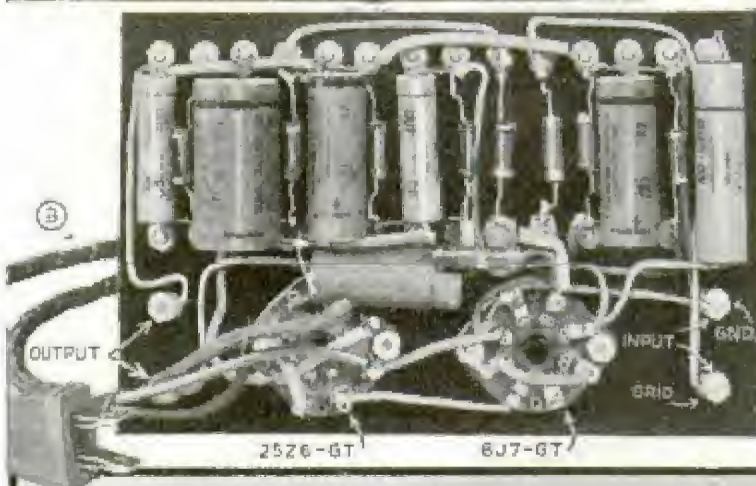


MOST radio experimenters and music lovers know that the frequency response at the lower end of the audio spectrum falls off even in the finest radio receivers. In other words, many of the low notes are missing. The actual bass response needed can be restored by using a very large speaker baffle, or a specially constructed speaker cabinet. The use of an ordinary tone control merely cuts off the high-frequency response and makes the base appear stronger, but this actually results in some distortion.

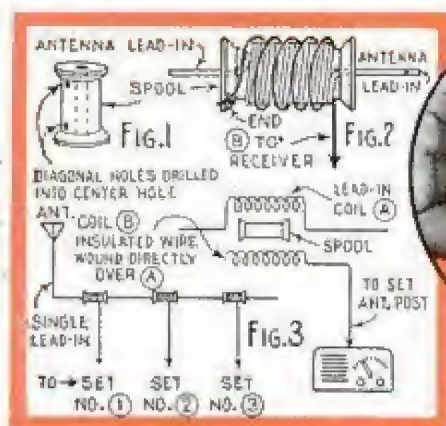
Many attempts have been made to correct this shortcoming electrically and a practical solution to the problem is offered by the M. R. Jones compensation circuit, simplified construction details of which are given in this article.

In order to bring out the low frequencies from 40 to 150 cycles, this circuit uses only two tubes and accomplishes a result electrically which is physically impossible except by means of a baffle at least 50 ft. square. This "imaginary infinite baffle" unit uses only a fraction of the incoming audio signal and this is fed to the type-6J7-GT tube in a special high-

(Continued to page 138A)



Practical RADIO SUGGESTIONS

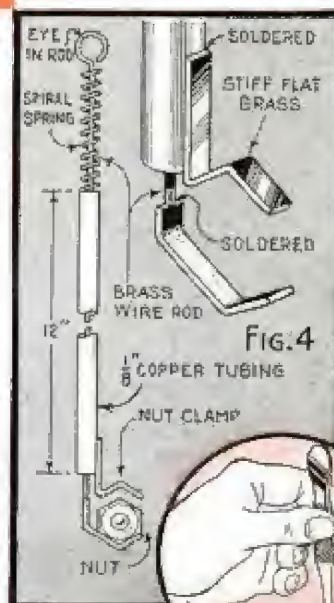


Winding details for homemade antenna set couplers

Right, receivers located in various rooms all operating on one efficient antenna; long, flexible insulated lead-in runs from room to room



Fig. 4 shows a handy aid for radio workers; this easily made gadget is a time and patience saver when trying to insert a machine screw through a nut behind some closely packed part of a radio chassis. Spring holds nut in position when plunger is released; tool also can be used when removing parts for repairs. Another useful tool for working on meters and other delicate apparatus may be made from a small pair of inexpensive tweezers as illustrated in Fig. 5. Fig. 6, auto set installation kink; gummed paper on underside edge of instrument board for pencil marks to locate bracket holes for drilling



Figs. 1, 2 and 3 show the simple method by which a single antenna may be used to serve all of the receivers in your home; does away with makeshift antennas with no interference when sets are tuned to different stations. Coil (A) consists of 20 turns of the antenna lead-in wire on a large spool at each receiver. Coil (B) may be 20 or more turns with one end dead, for inductively coupling each set. A layer of friction tape is placed over the completed windings on the spools which may be mounted in or near each receiver. Below, soldering-iron stand with built-in cup for steel wool to clean tip

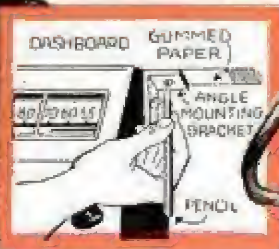
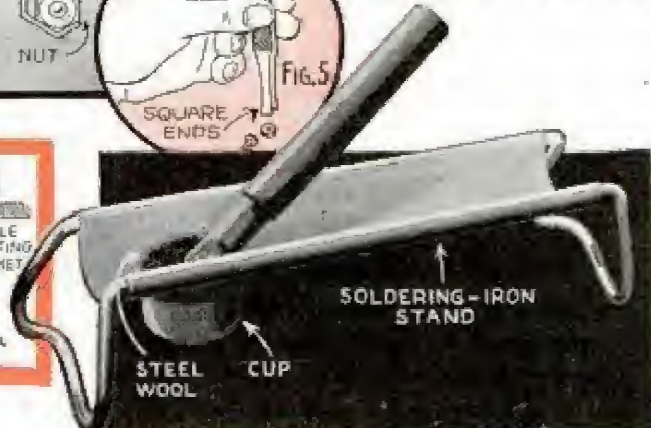
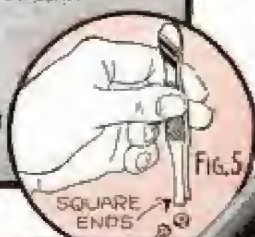


FIG. 6



Portable Microphone Holder Leaves Both Hands Free



Gooseneck adjusts "mike" to any desired position

Designed to fit any modern microphone, this wearable holder brings the "mike" close to the mouth yet keeps it out of the line of vision; for window demonstrators or safe driving in mobile use.

High-Fidelity Set in Kit Form

Experienced builders can assemble this high-fidelity radio receiver so that the speaker, tuner and audio amplifier may be located at different points and remotely operated. Primarily intended for reproducing radio programs from local stations to the utmost of their frequency range.



NEXT MONTH—A Four-Tube "Progressive" Receiver for Students and Experimenters. Starting with a 4-tube t.r.f. set you learn radio work by actual "doing." A later article will show how to convert this same set to a 6-tube all-wave super, using every part originally purchased. Also—**Low-Cost Sound System, Part II**

Four-Tube Frequency Standard

Four tubes serve as crystal oscillator, multivibrator, harmonic amplifier and power-supply rectifier in this low-cost frequency standard of interest to amateurs, service men and radio instructors.



Lens Enlarges Size of Image

This sight-and-sound set is equipped with a special lens which is built into the panel to magnify the television picture that



appears on the 5-in. "kinescope" tube. A shadow box housing the cathode-ray tube, obviates darkening the room and is claimed to add to the viewer's comfort.

Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

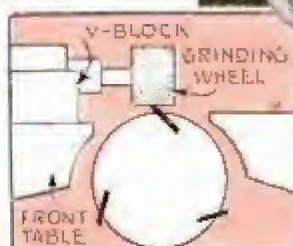
The Pullman Corp. 1944 New York 2611 S. 130 W. 56th St. American Television Corp. 1944 New York 2611 S. 130 W. 56th St.



SHOP NOTES

Keen Edges on JOINTER KNIVES

FROM dull knives that hammer and ripple to razor-sharp edges that leave a satin-smooth surface is easy with any of the simple setups shown. Wherever practical, best results are obtained if the knives are ground while mounted in the jointer cutterhead. This can be accomplished without even removing the head from the jointer, by the method shown in Fig. 1. The arrangement here calls for a flexible shaft carrying a small grinding wheel. The solid



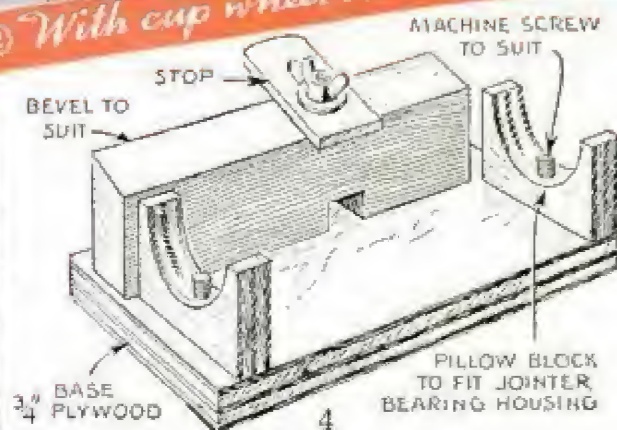
① *Without removing the head*



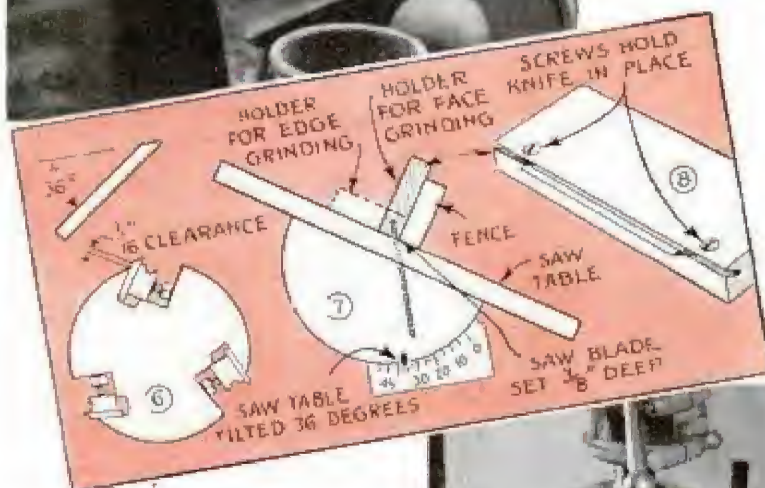
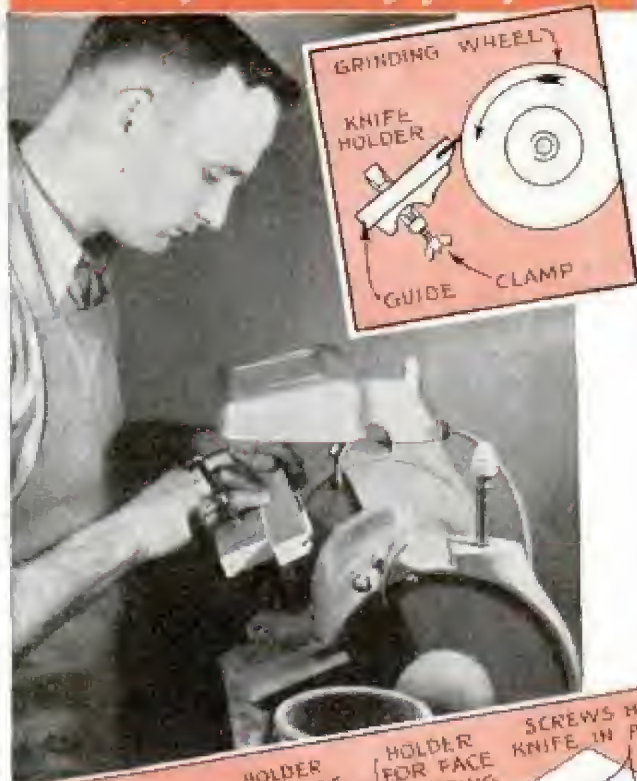
② *With cup wheel on drill press*



③ *On the lathe*



⑤ Knives ground singly on grinder



portion of the shaft is secured by means of a V-block. After adjusting the front table to the proper height, grinding is done by holding the V-block firmly against the table while moving the grinding wheel along the length of the knife. A clamp on the belt serves to hold the head immovable while each knife is ground in turn.

Fig. 2 shows grinding being done with a cup wheel on the drill press. A simple jig, the exact construction of which will vary for individual jointers, is made up, as shown in Fig. 4. A stop bar prevents the head from turning while grinding is being done, and also locates the knife to be ground at the proper position. If the drill

press is fitted with a column collar below the drill table, the jig can be clamped to the table and swung under the grinding wheel. Where a collar is not used, the jig would be pushed along the table.

A method whereby the knives are ground while mounted in the lathe is shown in Fig. 3. The slide rest provides a support for a flexible shaft and also permits feeding. The indexing head is used to bring each knife into place for grinding. Certain precautions must be taken in any method. First of all, high-speed steel knives should be ground dry, but slowly and with a very light cut. If you will jam the wheel (not running) lightly against the knife edge, you will set the cut quite nicely. Treat each knife exactly the same. Check all adjustments before you start to grind. Protect the jointer bearings by wrapping

string or a rag around the shaft. Even though the bearings may be fitted with grease seals, these are not sufficient to prevent the entry of the fine grinding dust.

Some workers prefer to grind the knives singly. This can be done by using a wooden holder, made by running a saw cut along the edge or face of a block of wood



Face and edge-grinding single blades

and providing two screws to hold the knife, Fig. 8. If grinding is done on the grinder, the holder is straight, as can be seen in the inset, Fig. 5; if done in any other manner, the holder has an angle cut. This angle cut is made by tilting the saw table 36 degrees, as shown in Fig. 7, this being the same angle as the included point angle of the average knife, Fig. 6. A face-grinding operation on the drill press is shown in

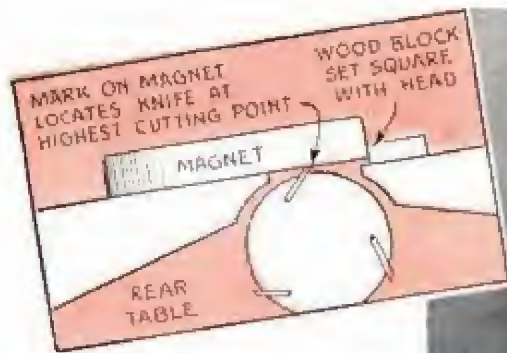


Fig. 9. Fig. 10 shows edge grinding. Both employ a straightedge clamped to the drill table, one to guide the work, the other to set the cut.

Whether knives are ground in the head or singly, it becomes necessary at times to reset the knives in order to maintain approximately $\frac{1}{16}$ in. back clearance, Fig. 6. Knife setting is ordinarily done with a straightedge, lining each knife level with the rear table of the jointer. A better method makes use of a magnet, as shown in Fig. 11, which not only supplies the straightedge but holds the knife in place while the screws in the locking bar are tightened. To use this method, clamp a block of wood across the front table to supply a stop for the end of the magnet. The block must be aligned exactly parallel with the slots in the joint-



⑪ Magnet holds knives level when resetting

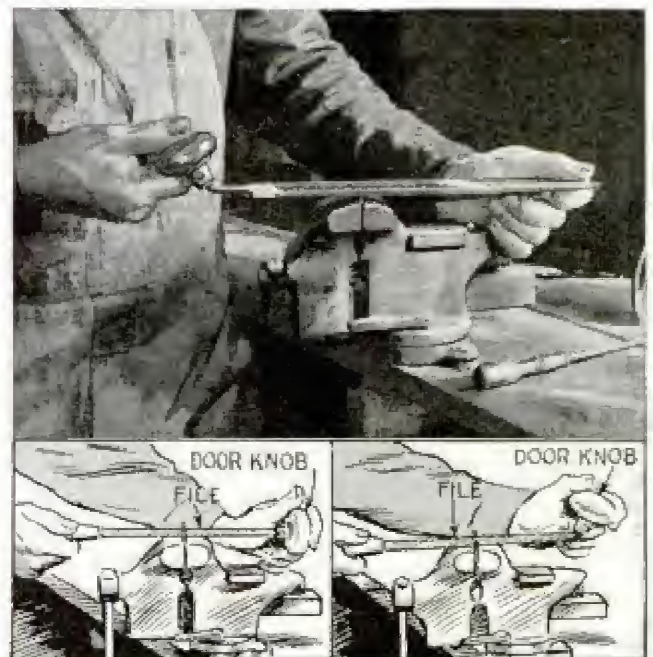
er head. Now, place the magnet in position on the rear table, and locate on the magnet the exact spot where the knife is at its highest cutting point. Make an arrow at this point. Each knife is set to this mark, as shown in the photo. Finally, it must be remembered that grinding alone does not make a complete sharpening job. Go over each knife carefully with an oilstone in order to remove burrs and other slight imperfections that may have been caused by the grinding operation. Don't forget to draw up the nuts on the locking bars to an even tension.

Door-Knob Handles on Ends of Files Provide Good Grips

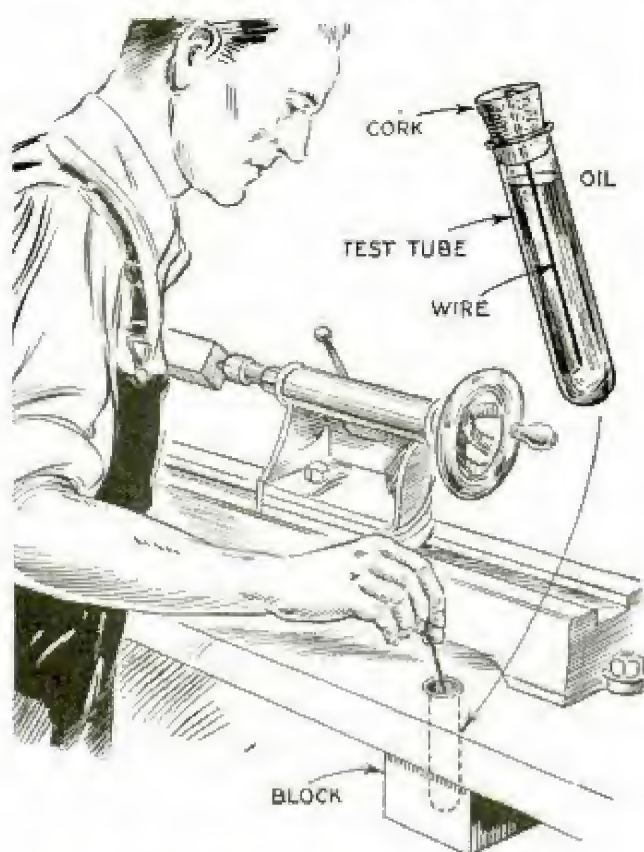
Ordinary door knobs provide good handles for files and help to eliminate accidental cuts and bruises when sharpening tools because the hand is above the work. In the upper detail, the file tang is bent upward, a slot being filed in the side of the tang to take the knob set screw. The lower left-hand detail shows a round file with a knob on the end opposite the tang. The set screw is turned into the file teeth where it will hold firmly. The right-hand detail shows the most convenient way of using a round file. The small end is heated and bent to the desired angle to take the knob.

—W. M. Mutschler, Lincoln, Nebr.

☞ A teaspoonful of vinegar added to the fat in which doughnuts are fried will prevent their absorbing too much grease.

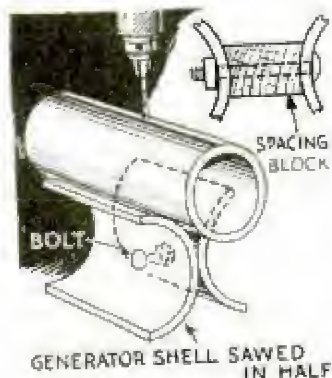


Well in Lathe Bench Holds Oil to Lubricate Centers



To have oil conveniently at hand for lubricating lathe centers, one machinist made a well in the bench near the lathe. The well consists of a hole drilled through the bench top and into a reinforcing block on the underside to take an ordinary test tube. This is fitted with a cork carrying a wire which projects into the oil and serves as applicator. If rough work around the bench is likely to break a glass test tube, use a short length of brass pipe with a cap screwed to each end.

V-Block from Halved Generator Withstands Hard Use



By sawing the shell of an old auto generator or starting motor in two and bolting the halves together as indicated, you have a useful and rugged V-block, which will serve efficiently for a wide range of

work diameters. Very large work may be held by removing the center bolt and interposing a wooden block between the halves. This spacing block must be shaped at the ends to fit the curvature of the shell. Turned on its side, the V-block is convenient for supporting a complete generator or motor for bench-repair operations or testing. By using two of the blocks, long work such as drive-shaft and rear-axle assemblies can be handled.

—W. C. Wilhite, Carlinville, Ill.

Price Tags on Spring Clips Grip Pottery

Attaching price tags to dishes, pottery and other hard, smooth surfaces is easy with paper clips of the type shown. The stem of the tag holder is soldered to the clip.



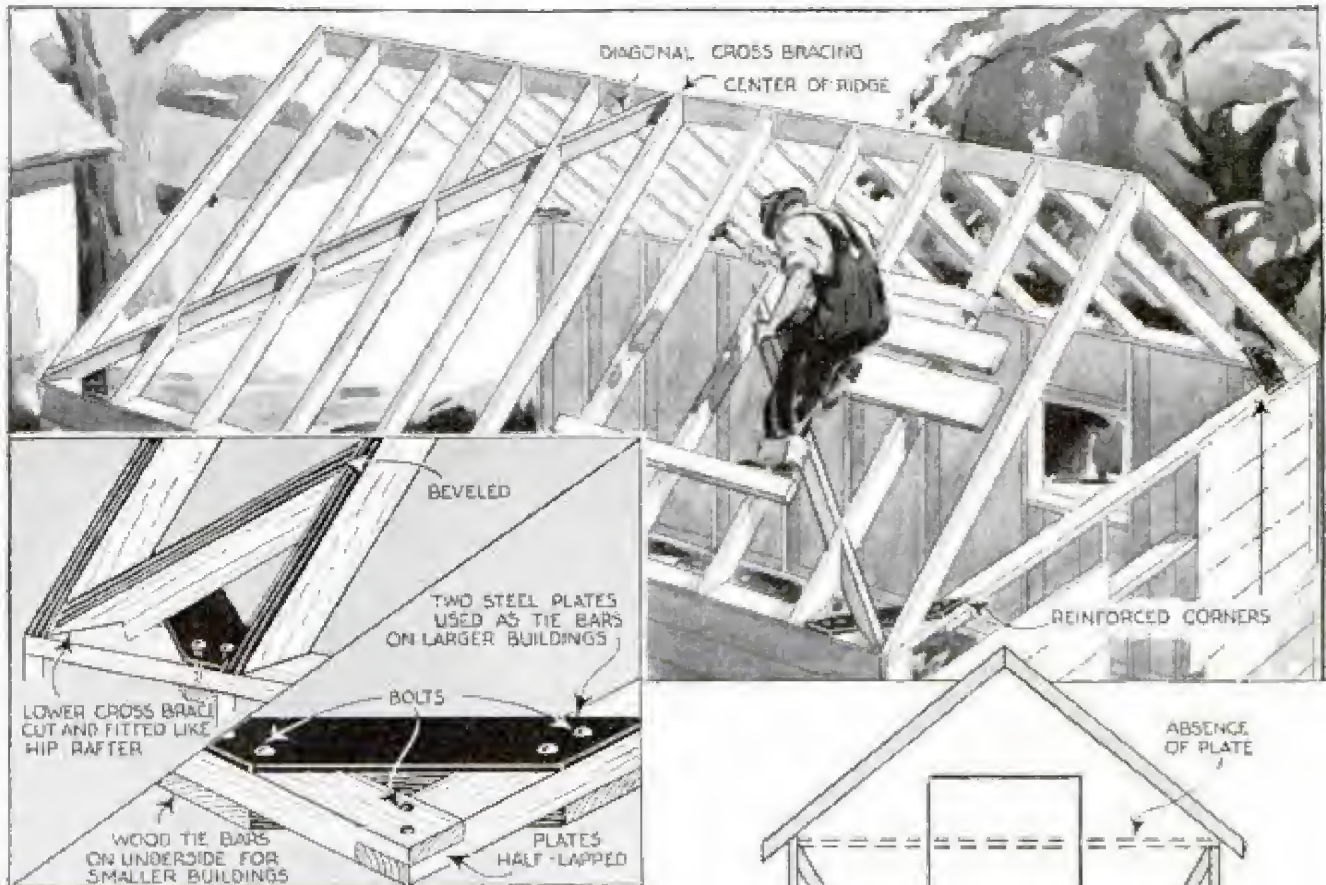
Super Locked on Beehive with Sash Fasteners

Instead of piling rocks and other weights on top of a beehive to keep the super from being knocked or blown off, use window-sash fasteners, which are neat and easy to use. One part of the fastener is screwed to the top edge of the hive and the other is fastened to the lower edge of the super.

—A. S. Wurz, Jr., Rockyford, Alta., Can.



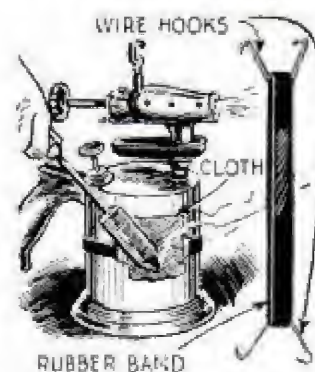
Diagonal Bracing Strengthens Roof Framing



Where it is desired to prevent a roof ridge from settling at the center in cases where joists cannot be used to tie the lower ends of the rafters together on opposite sides of a building, diagonal rafter bracing has proved satisfactory, especially where the ridge must support considerable weight such as a small crane traveling the entire length of the building. With this method of bracing, stress is transmitted to the corners of the framing instead of being distributed along opposite sides. For this reason it is necessary to provide rigid corners, which is done by half-lapping the plates and fitting diagonal cross braces or tie bars as shown. For small buildings, one diagonal brace may be bolted to the underside of the plates, two bolts being used at each junction as well as through the half-lap at the corner. For larger buildings where stress is proportionately greater, two steel plates, one above and one below, are bolted in place. Size of such plates and the number of bolts are dependent on the rigidity and strength needed. On very small buildings where the top of the door is above the plate, diagonal braces may be installed as in the lower-right detail.

Pad to Wipe Soldering Iron Clamped on Blowtorch

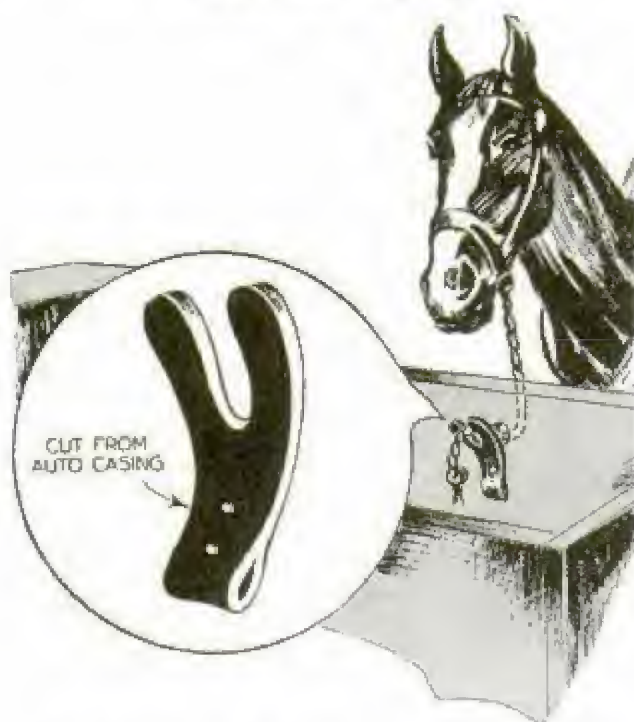
To keep a cloth at hand for wiping the point of a soldering iron, one tinsmith fastens it on his blowtorch with a rubber band and two double wire hooks.



The pad is placed against the side of the torch and the rubber band is drawn around it so that the hooks engage the cloth to hold it in position for instant use.

Steel rods and tubing for metal-working projects can be obtained cheaply by dismantling old metal bedsteads obtained at a junk yard.

Halter Rope Fastened to Manger Without Tying



To fasten a halter rope to a manger without tying, a farmer used a crotched stop cut from an old auto casing. This is nailed to the inner side of the manger just below the rope hole. In use, the end of the rope is inserted through the hole and then dropped into the crotch of the stop. Any pull on the rope forces the stop against the manger and prevents the knotted end of the rope from slipping through the hole.

Sharpening Pointed Tools with Two Files

When filing a pointed tool such as an awl, centerpunch, etc., it is a good idea to set two files in a vise with their flat surfaces forming a right angle as shown. The tool is then sharpened in the angle thus formed. Using the files in this manner

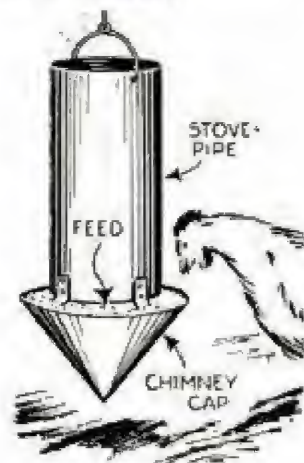


keeps the tool from slipping off the edge, and you have the advantage of two abrasive surfaces, which speed the work.

—Bertram Brownold, Woodmere, N. Y.

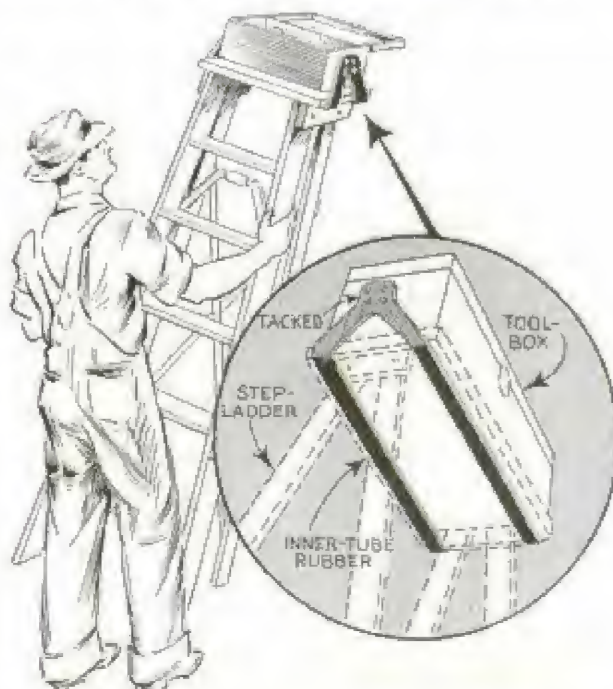
Converted Chimney Cap Provides Feeder for Poultry

Fitted to a length of large stovepipe and inverted as indicated, a sheet-metal chimney cap provides a good automatic feeder for poultry. The assembly can be hung from the ceiling in the brooder house or any other convenient place.



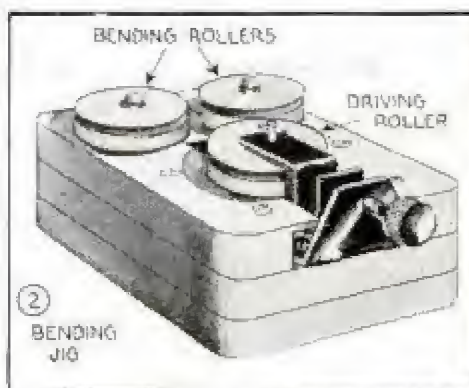
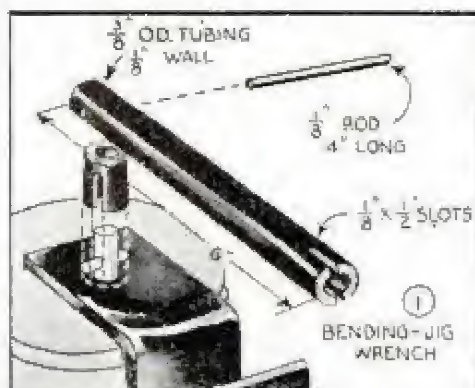
Rubber Strap Keeps Tool Kit on Stepladder

Instead of setting his tool kit on the ground each time the stepladder had to be moved, a sign writer fastened the kit to

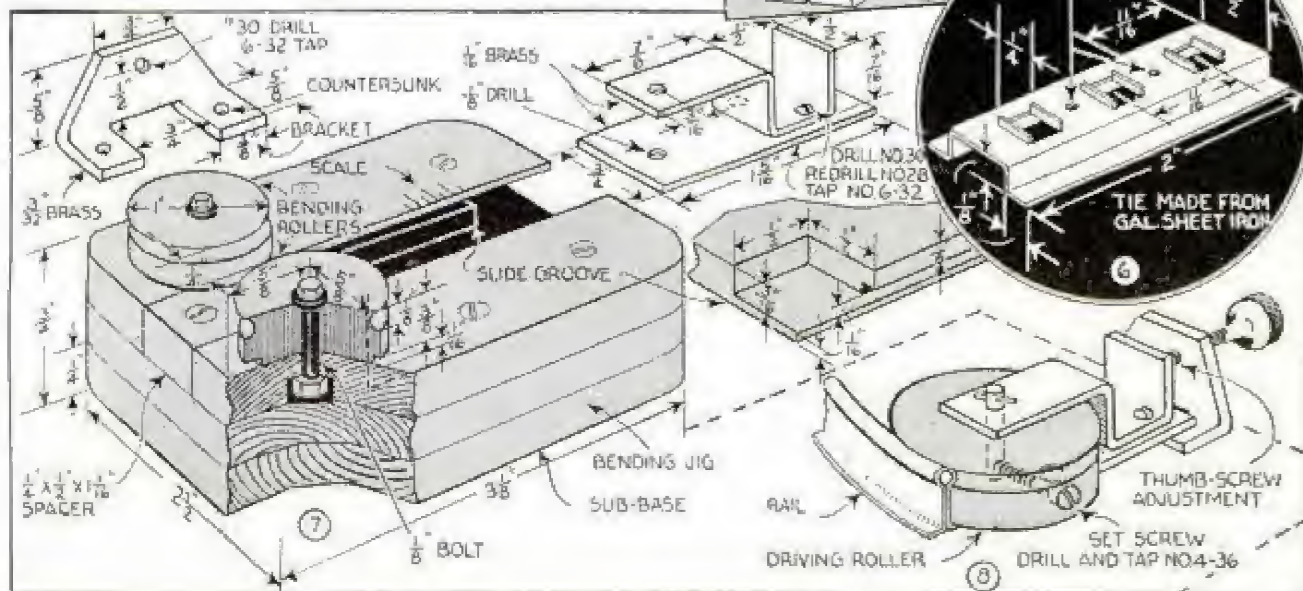
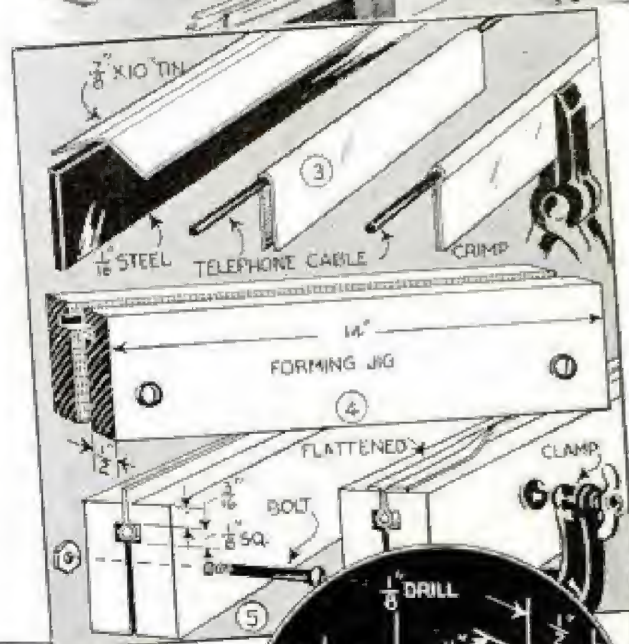


the top of the ladder with a removable rubber strap. This was cut to the shape shown and tacked to the ends of the kit. In use, the tool box is set in place and the straps pulled down underneath the ladder top to anchor it securely.

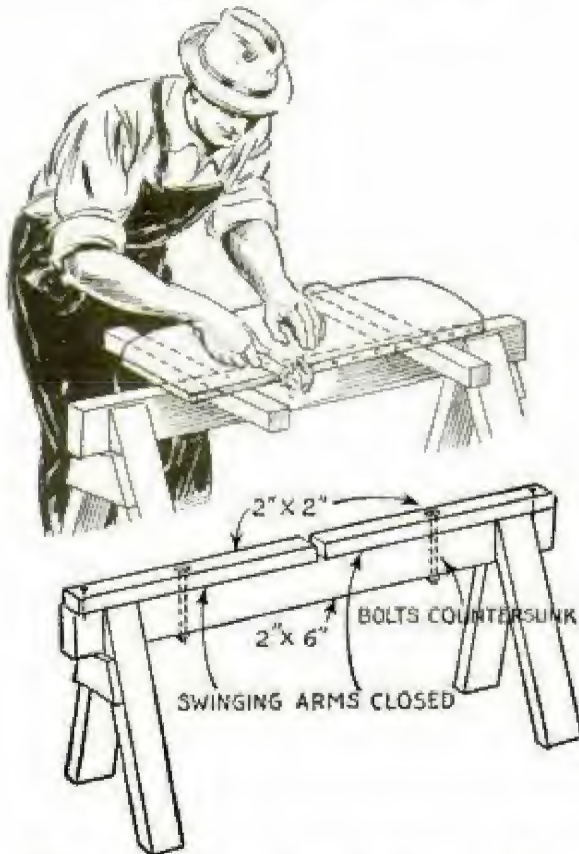
Tinplate Track Made in This "Rolling Mill"



Consisting essentially of a forming jig and a bending jig worked in combination, this miniature rolling mill turns out both curved and straight tinplate track with precision and speed. Figs. 3 and 4 detail the forming jig and picture the steps in making a rail. Although hardwood will do for the two members of the jig, flat cold-rolled steel of the same dimensions is much better. Grooves for the rail tread can be cut with a milling machine. The bending jig, Figs. 1, 2, 7 and 8 gives a true radius bend to the rails which are to be assembled into curved track sections on ties made as in Fig. 6. Being adjustable, it will bend rails to practically any radius desired. Three thicknesses of hardwood form the base for the two stationary bending rollers, Fig. 7. The adjustable roller, Figs. 2 and 8, is mounted on a slide controlled by a thumbscrew. All rollers have the edges machined in profile to the sectional dimensions of the rail so the latter is not distorted when passed through them.

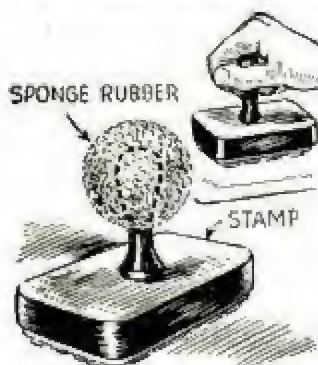


Swinging Arms on Sawhorse Top Support Wide Work



Often needing a bench-like surface to support wide work on jobs away from his shop, one carpenter pivoted a couple of arms to the top of one of his sawhorses. When needed, these could be swung around to support the work, and when not in use were moved around parallel to the top of the sawhorse where they were held by nails dropped through holes in the ends. When the arms were swung to this position, the sawhorse was ready for use in the regular way.

Hand Stamp Has Rubber Grip



A shipping clerk who had to use a large hand stamp in marking numbers of wooden boxes slipped a sponge rubber ball over the grip of the stamp to prevent bruising the palm of his hand.

The ball can be made from a rubber sponge by cutting the latter to shape with a pair of scissors. A small hole in the center of

the ball is made with a sharp instrument so that it can be slipped over the handle of the stamp.

Stock Salt on Concrete Tile Is Kept Off Ground

Instead of putting his stock salt on the ground or in a box where it is likely to be wasted, one farmer sets it in the bell end of a concrete tile. This is set in the ground

to prevent tipping. If loose salt is used, the tile can be partly filled with concrete and a drain provided to carry off rain water.



Tumbling Barrel Mixes Feed

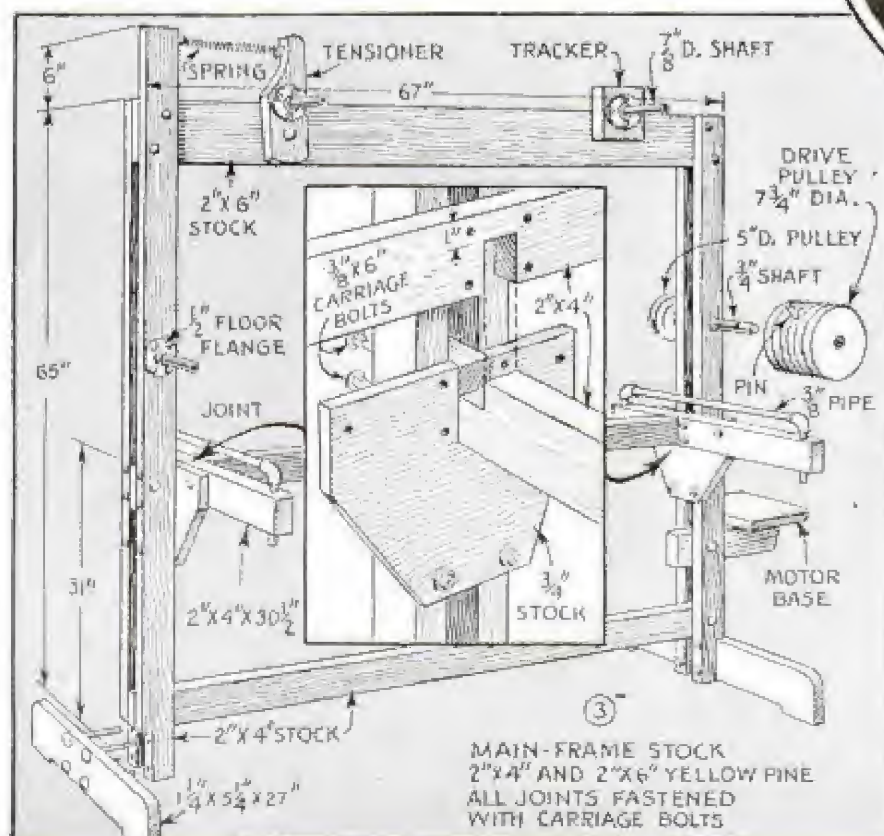
Farmers will find this barrel feed mixer a timesaver. Two inverted V-units form the ends of the supporting frame, the units being connected and braced with boards across the ends and one side. A floor flange on each end of the barrel takes a short pipe axle at one end and a longer pipe, which terminates in a crank, at the other end. Bearings are holes bored through the frame and well greased. The door to fill the barrel is made by sawing through three or four staves in the center and fastening them together with light iron straps.





BELT SANDER

TOUCH control, full visibility, and capacity to handle wide boards and table tops, are the excellent features of this belt sander. The general construction and method of working will be apparent from Figs. 1 and 3. There is a wooden frame carrying four wooden pulleys over which the 6-in. sanding belt runs. The worktable, adjustable in height to accommodate stock $\frac{1}{4}$ to $2\frac{1}{2}$ in. thick, is

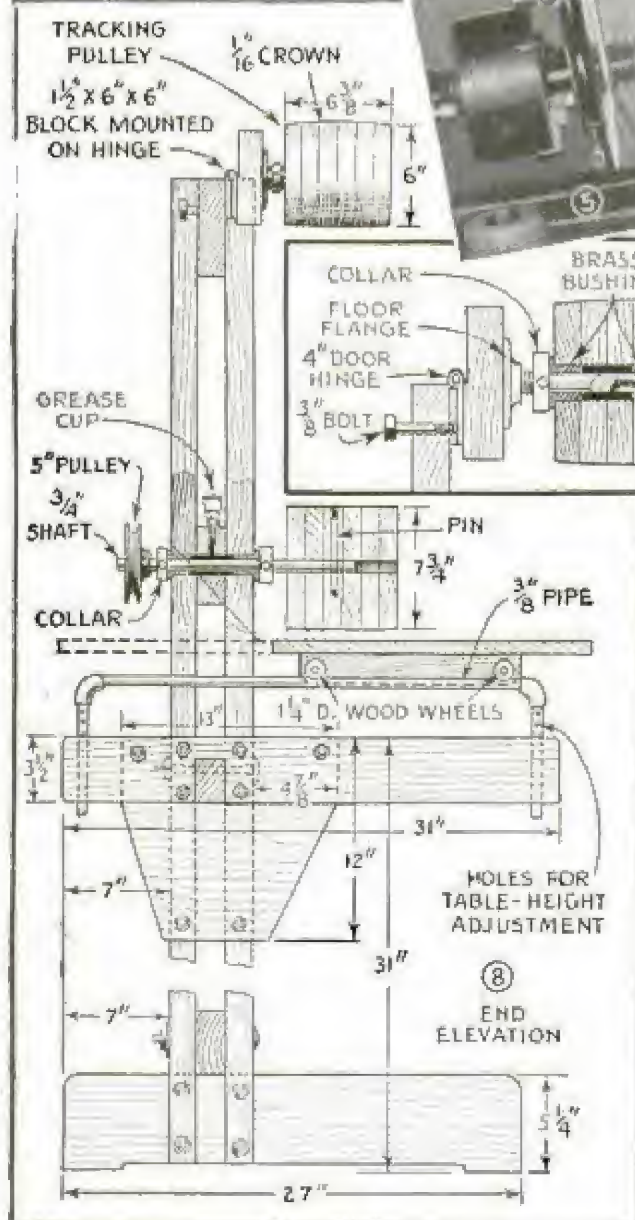


mounted on rollers so that it can be pushed backward and forward below the belt as the stroker applies pressure to the work.

Start construction by making the wooden frame. Standard yellow pine 2 by 4 and 2 by 6 in. is used, jointed on both edges. Fig. 3 shows the assembly, while Figs. 4 and 8 show how the main joints in the framework are made. Each pulley will require six pieces of wood $1\frac{1}{8}$ in. thick. Three



of the pulleys measure 6 in. in diameter, while the drive pulley measures $7\frac{3}{4}$ in. The disks are rough-cut on the band saw and then assembled with $\frac{1}{4}$ by 6-in. carriage bolts and glue, as in Fig. 2. The two outer disks on the three small pulleys are cut out in the center, $3\frac{1}{2}$ in. in diameter, as can be seen in Figs. 7 and 9. The center hole through the small pulleys is 1 in. in diameter; through the drive pulley, the hole is $\frac{3}{4}$ in. in diameter. Fig. 6 shows the drive pulley set up for turning, the $\frac{3}{4}$ by 12-in. shaft fitting through the hole drilled through the pulley. Fig. 5 shows the method used in mounting the small pulleys for turning. Each is first fitted with brass bushings, tapping these in around the shaft, as in Fig. 10. The $\frac{7}{8}$ by 6-in. shaft then can be mounted in a

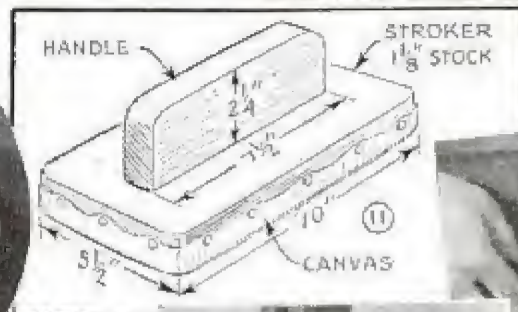
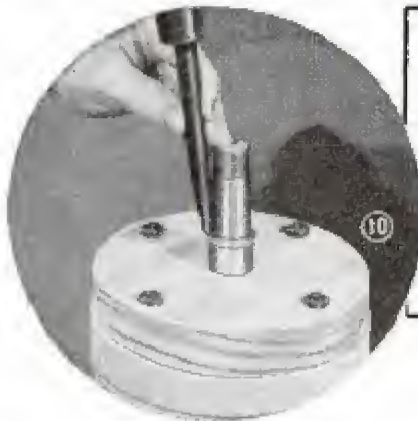
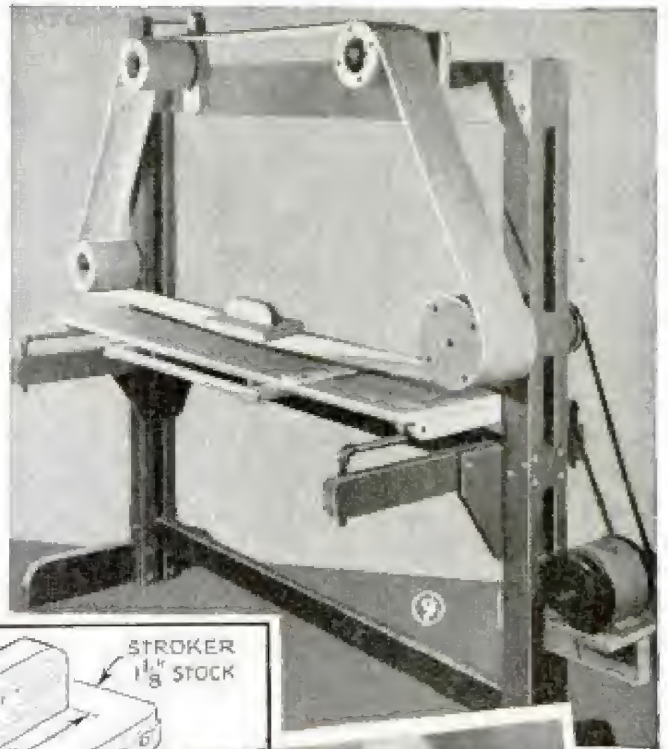


three-jaw chuck and the pulley turned by means of the set-up shown.

In Fig. 8, note that the drive shaft is carried through the framework, the pulley being pinned to the shaft. The three small pulleys rotate on their shafts, the latter being threaded at one end to fit $\frac{1}{2}$ -in. pipe floor flanges bolted to the framework. Referring again to Fig. 3, it can be seen that the shaft directly opposite the drive shaft is fitted to the frame. The upper shaft on this same side is fitted to a 12-in. length of 2 by 4-in. stock, this wooden arm being pivoted on a $\frac{3}{8}$ -in. carriage bolt. This is the tension idler which stretches the belt, tension being provided by means of a spring. The shaft of the tracking pulley is fitted to a hinged wooden block which can be moved in or out to make the belt track properly, Fig. 8. One leaf of the heavy

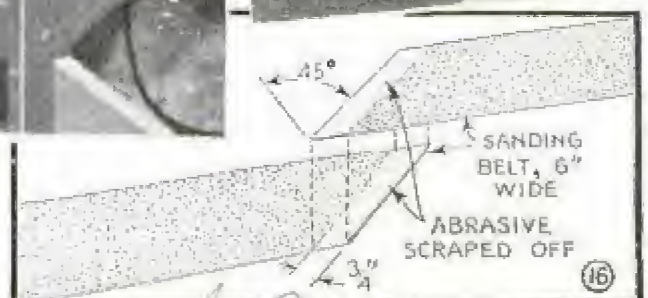
door hinge is threaded to take a $\frac{3}{8}$ -in. bolt. Turning the bolt in opens the hinge, thus tilting the pulley. Each idler is fitted with brass bushings at either end, the pulley being held in place by means of collars. The outer end of the shaft is tapped $\frac{1}{8}$ in. to take a grease cup. The inside end of each shaft is threaded to fit the $\frac{1}{2}$ -in. pipe floor flange. After threading into the flange, the shaft end should be peened.

Fig. 12 shows how the worktable is fitted with wooden wheels so that it can be pushed across the $\frac{3}{8}$ -in. pipe framework which is provided with an adjustment consisting of a number of holes in the short uprights so that the table can



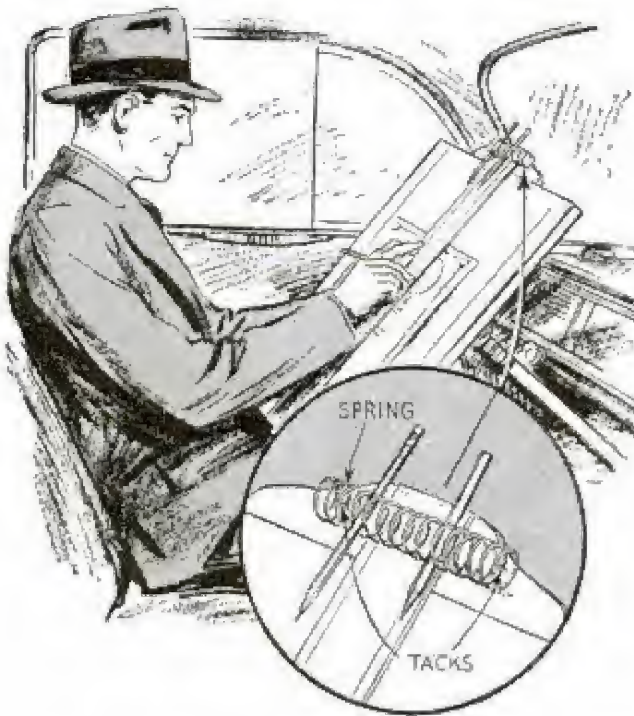
be raised or lowered as required. The stroker should be made to the approximate dimensions given in Fig. 11. The bottom of the base should be rounded very slightly and covered with felt and canvas.

Sanding belts are made from cloth-backed garnet, 6 in. wide and approximately 15 ft. long. The joint is a 45-degree skive, Fig. 16, the abrasive being removed by dipping the ends of the belt in warm water, as shown in Fig. 13. This softens the glue and permits the removal of the abrasive grains, Fig. 14, after which the joint can be glued together, as shown in Fig. 15. Speed of the pulley should be from 1,200 to 1,500 r.p.m. A $\frac{1}{2}$ -hp. motor will serve for light work but for maximum capacity a $\frac{1}{2}$ -hp. motor should be used. When sanding continuously over a considerable period of time, lift the stroker block occasionally to avoid undue heating.



*Ruentzel Chime Clock Co.
Sutterville, Cal.*

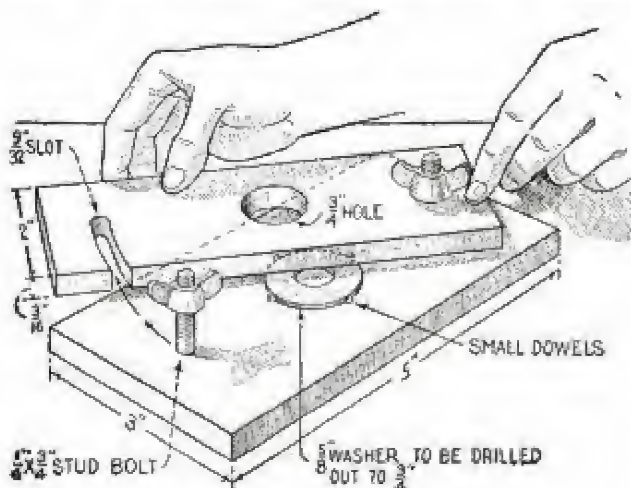
Coil Spring on Head of T-Square Keeps Pencils Handy



An architect who sometimes makes sketches on a board in his car or on the job where construction is being carried on, keeps his pencils at hand in a coil spring fastened to the head of his T-square. Before fastening the spring in place the coils are stretched so that the pencils can be inserted between them easily.

Clamp Jig to Make Washers

You will find this simple jig handy when it is necessary to make a washer, or enlarge the hole in one. The lower plate of the jig is clamped on a drill-press table or in a vise, and the upper plate is used to clamp the washer firmly against it. When

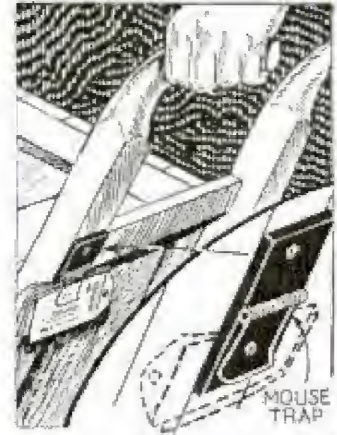


a quantity of identical washers are to be drilled, the centering dowel pins are used.

—R. H. Johnson, Pasadena, Calif.

Orders Clipped to Hand Truck in a Mousetrap

Invoices are always at hand on a truck by clipping them under the jaw of a mousetrap screwed under one handle. This idea is especially useful in keeping the invoices and other data with the



packages when several trucks are loaded and pushed aside temporarily.

Thimble on Glass Cutter to Apply Pressure

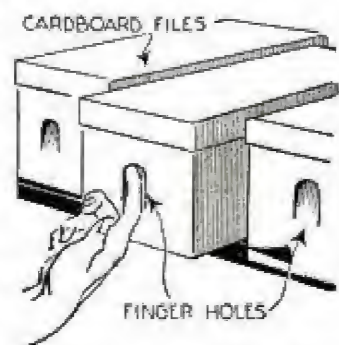


Taped to a glass cutter as indicated, a sewing thimble serves as a finger rest and enables you to apply pressure to the cutter without excessive finger strain. The thimble should be large

enough to take the end of the index finger without squeezing it.

Finger Holes in Cardboard Files Make Them Easy to Move

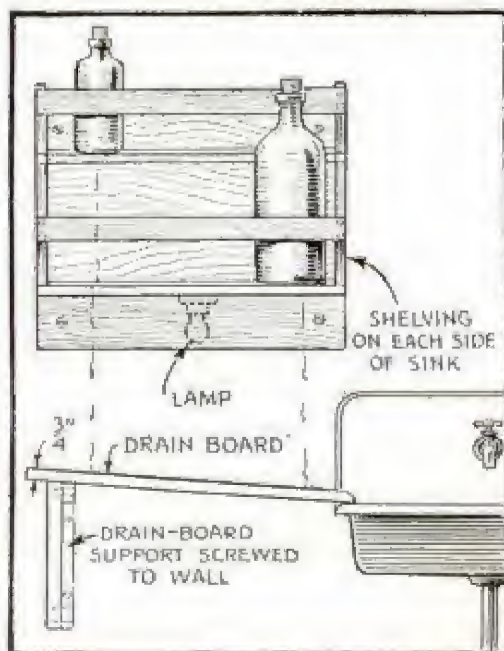
When cardboard boxes are used as files for letters and other papers, the covers are often damaged in pulling them from the shelf. This trouble can be avoided if a slit is cut in the front of each box, as indicated, so that the tab portion may be pushed in for inserting the finger tip into the box end.



Drip-proofing Your DARKROOM SINK



In a photo darkroom, a carefully planned arrangement of shelving to drain moisture into a sink from dripping trays, tanks, bottles and other wet equipment will go a long way toward assuring a safe, dry floor. The shelves, which are set at a slight angle to promote drainage, are located conveniently over the sink, and if they extend beyond the limits of the sink, drain boards are provided on the ends of the latter. To prevent bottles from sliding off the inclined shelves, guard rails are provided. After the installation has been completed, the shelving is given an application of hot paraffin to minimize absorption of moisture in the wood.



TWO OR MORE SMALL METAL SINKS MAY BE JOINED TOGETHER WITH ONE SET OF SHELVING

DEVELOPING TRAYS, 11" X 14" AND SMALLER

RAIL 2" X 2"

3"

DROP

SLOT

FERROTYPING BOARDS AND SINK GRATES

CLEARANCE PERMITS VENTILATION BEHIND SINK

FLAT TANKS

GAL.-SIZE BOTTLE

1" X 2" RAIL

PITCH 1/2" PER FT.

BAFFLE

LAMP

6"

12"

4"

10"

8"

WALL

2"

2"

2"

2"

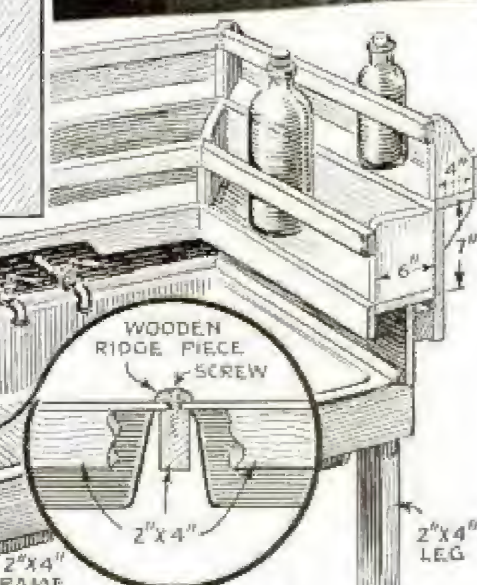
2"

2"

2"

2"

2"



2" X 4" FRAME

2" X 4" LEG

Sack on Wing Keeps Turkey from Flying over Fence



To keep turkeys from flying out of pens, one farmer, who raises a small number of them each year, puts a flour sack over one wing of each bird. The sack prevents the turkey from spreading its wing, the cloth at the mouth of the sack being gathered at the wing joint and tied. Be sure that the string is wrapped only around the outside of the cloth so that it does not touch the flesh of the bird, otherwise the string may injure the wing.

Planter Wheel Serves as Feeder for Small Live Stock

This planter-wheel feeder is made quickly and inexpensively as it requires only a square, wood platform for a bottom. The wheel is fastened to the latter by long bolts, which hook over the rim. A rod in-



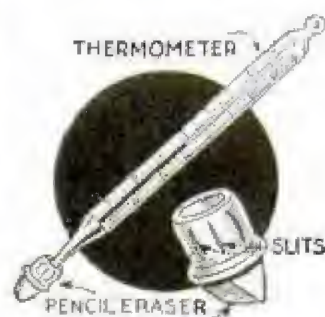
serted in the wheel hub permits the feeder to be tipped on its side easily for cleaning and draining.

Bottle Sealed Temporarily With a Glass Tumbler

When bottles containing highly volatile fluids have to be opened frequently in laboratories, small glass tumblers or other containers are often turned upside down over the mouths of the bottles to prevent evaporation. If a large rubber washer is slipped over the neck of the bottle as indicated, a good seal is provided to further reduce evaporation of the contents.



Bulb of Thermometer Protected by Rubber Eraser

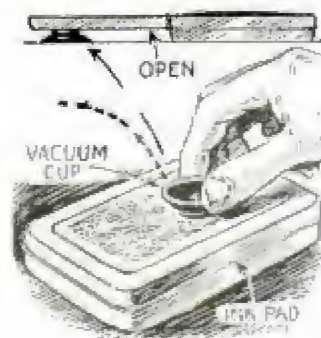


Thermometer bulbs of the type used in laboratories, photo studios, dairies, etc., can be protected against breakage by slipping a pencil eraser of the type shown over the

end. Cut several slits in the eraser as indicated and the thermometer can be used without removing the eraser when temperature readings are not critical.

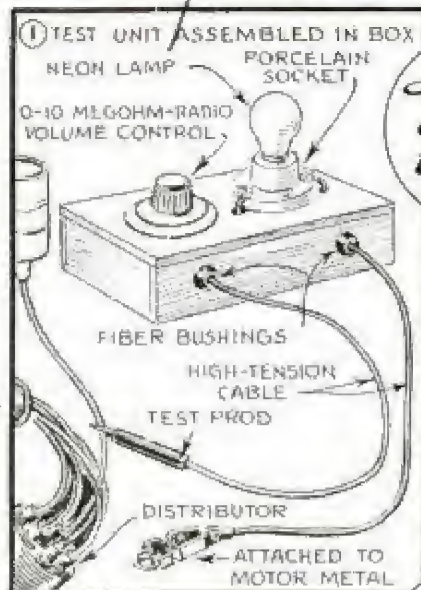
Vacuum Cup on Stamp-Pad Lid Prevents Slipping

To hold a stamp pad securely on a desk, attach a rubber vacuum cup to the lid as indicated. Opening the lid and pressing the cup against the desk top holds the pad securely.

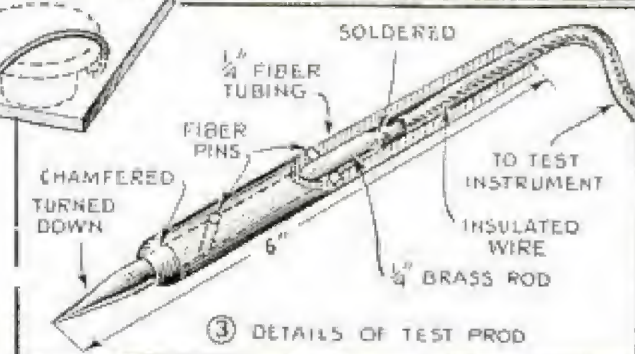
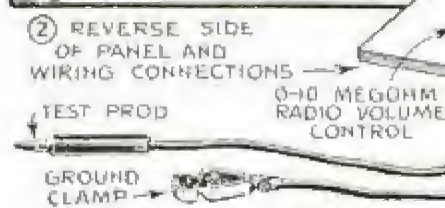


Aurora Sign Co.
1150 Washington Blvd
Pittsburgh Pa

Electrical Test Units Detect AUTO FAULTS



Auto-cable tester



By C. A. CROWLEY

THESE simple electrical devices for testing high-tension ignition cable, for finding weak cells in a battery, and for detecting short circuits, grounds, and open circuits in armatures can be built easily at low cost.

Cable Tester: A compact and portable testing unit for cable is shown in Figs. 1, 2 and 3. It consists of a neon lamp, a 10-megohm variable carbon resistor, such as a radio volume control, and two test leads. In use, the lead equipped with the clip is grounded to the frame of the car and the resistor is set to maximum resistance. The test prod is then passed over the cable with the motor running at idling speed, and the resistance is gradually reduced until the lamp flashes. The dial reading at which the flash occurs is a measure of the quality of the cable. The lower the flashing resistance, the better the cable. If the flash point for a cable is found, it can be tested for weak points or faults by increasing the

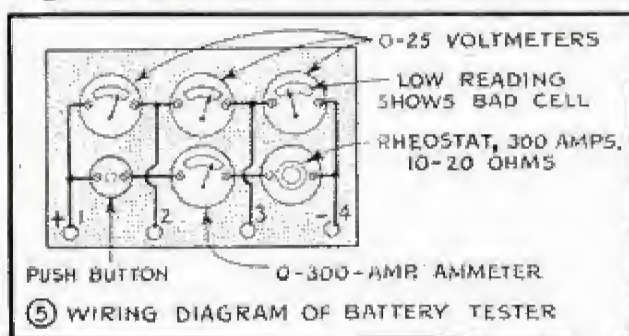
resistance just enough so that the lamp will not flash. If the prod is now passed over the cable, leaving the resistance unaltered, a flash will occur at any point where the cable is faulty.

Testing Battery Under Load: A quick test for a storage battery to show its performance under a heavy load, such as starting, can be made with the unit in Figs. 4 and 5. It consists of three voltmeters, an ammeter, and a variable resistance capable of carrying loads up to 300 amps. Inexpensive meters can be used. If preferred, one voltmeter and a three-position switch will serve the purpose. A push button is provided for the test, and four clip leads are needed to make connections to the battery.

To make a test, first record the voltage of each cell on open circuit, which should register slightly over 2 volts. Then press the push button and adjust the rheostat



④ HOW TESTER IS CONNECTED TO BATTERY



until the ammeter reads 30 amps. A good cell should show 2 volts or more at this discharge rate. Now adjust the rheostat until the ammeter shows 150 to 250 amps. to simulate the starting load. Use the same current for each test. Readings under heavy load should be taken rapidly to avoid unnecessary drainage on the battery. All cells should read alike and no cell should show a lower voltage than about 1.6. This test can also be made as shown in Fig. 6, using a voltmeter. First connect it across one cell, throw out the clutch and press the starter switch, noting the fall of the voltmeter reading. Repeat with the voltmeter connected across the other two cells. While the equipment required is less, this test is not as satisfactory as it does not permit an easy comparison between two batteries or test of a battery outside the car.

Testing Armatures: With the instrument shown in Figs. 7, 8, 9 and 10, starter

and generator armatures can be tested for short circuits, grounds and open circuits, without removing them from the car. Readings on the meter indicate the condition of the armature. Fig. 7 shows the assembly. A millivoltmeter is used and it is important to know its resistance as the size of the resistance *A* connected in series with the meter, as shown in Fig. 7, depends on the resistance of the meter. The resistance can be found in the table of Fig. 10. A fixed radio resistor of the required resistance can then be connected in place. A resistor rated at 2 watts is satisfactory for this purpose.

The coil of Nichrome wire can be wound on a porcelain tube such as is used in knob-and-tube wiring. A 3-ft. length of No. 18 Nichrome wire is folded at the center and a brass machine screw with washers fastened at that point, as shown in Fig. 8, to form the center tap on the coil. The wires are twisted together for an inch or so, and the remaining wire is wound around the porcelain tube. The coil is mounted on a pair of brass brackets, by slipping a bolt or threaded rod through the tube and fastening with nuts. It will be necessary to insulate one of the brackets from the bolt with fiber or mica washers. The ends of the coil can be attached to the brackets, and connections to the coil can be soldered to them. Connections to the tester are shown in Fig. 9.

Testing for Grounds: The long clip lead is connected to the "hot" post of the ammeter. The wire normally connected to the generator or starter terminal is disconnected, and the short clip lead is connected to the generator or starter in its place. If the cutout is mounted directly on the generator, it should be removed temporarily and the short clip lead connected in its place. All brushes should be lifted from the commutator with fiber or wooden spacers for the ground test.

With preparations made as described above, and with the switch open if testing a generator or closed if testing a starting motor, the test prod is touched to several points on the commutator. If the meter does not read zero, a ground is indicated. As this can be caused by the presence of foreign matter, the armature should be removed and cleaned thoroughly, then retested for grounds.

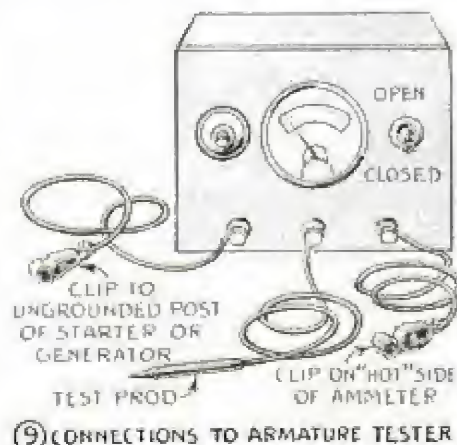
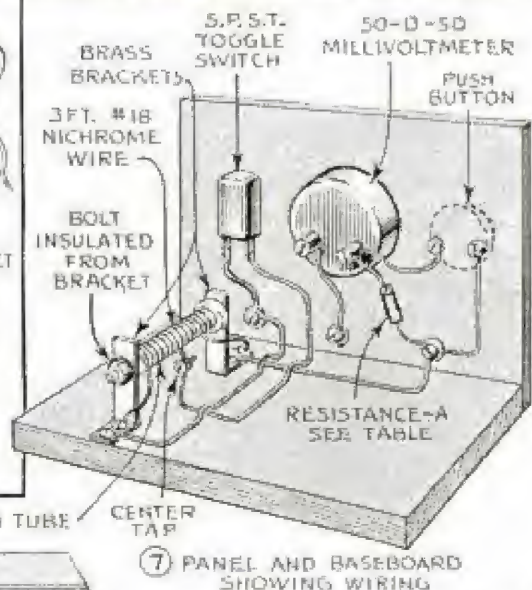
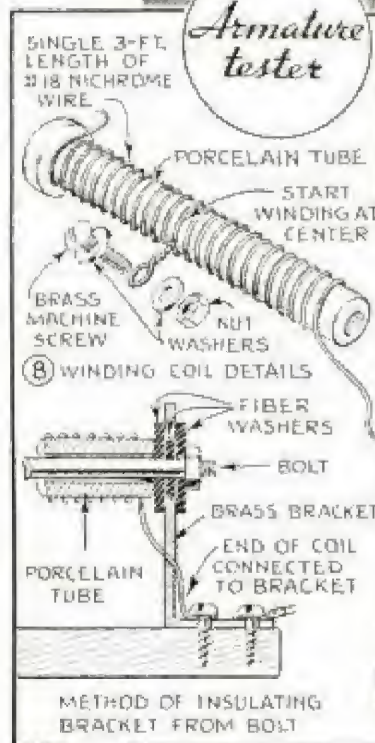
Open Circuit Test: The props are removed from beneath the main brushes so that they contact the commutator as usual, but the third brush, in the case of a generator, is left insulated from the commutator. Touch the test prod to the two main brushes in turn; one will give a zero reading, or a reading much below that of the other. This is the test brush.

Now turn the armature until one commutator segment has just passed out of contact with the test brush. Touch the test prod to this segment. Any reading other than zero indicates an open circuit.

Test for Short Circuit: This is carried out in exactly the same manner as the open test, except that the push button is pressed when taking the reading. The reading for each segment of the commutator should be the same. A reading lower than the others on one segment indicates a short-circuited coil. Zero reading indicates a dead "short." In some instances, a dirty armature otherwise in good condition will test shorted.

Fitting Brake Lining to Turned Drums

After turning down brake drums, put a gasket between each shoe and its lining to increase the over-all diameter of the shoe assembly. If this is not done, the lined shoes will fail to contact the drums their full length due to the difference in contours. This results in poor brakes because you do not get the benefit of the full braking area. Thickness of the gaskets should be equal to the amount of metal removed from the drums.



RESISTANCE REQUIRED IN SERIES WITH MILLIVOLTMETER

Resistance of Millivoltmeter	Required Resistance
0-1 ohm	200 ohms
1-2 "	300 "
2-3 "	500 "
3-4 "	700 "
4-5 "	900 "
5-6 "	1000 "
6-7 "	1250 "
7-8 "	1500 "
8-9 "	1750 "
9-10 "	2000 "

10

Length of Pipe Removes Wheel When Puller Is Unavailable

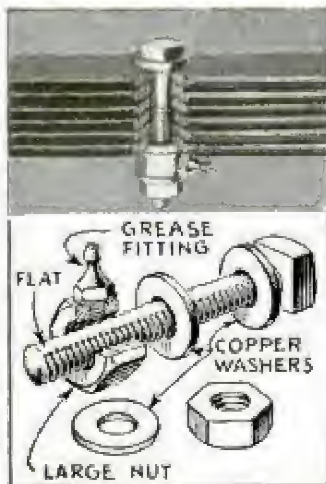


LENGTH OF 2" PIPE

If you have to remove a rear wheel and there is no puller at hand, try the following method: Jack up the wheel and lay a length of 2-in. pipe on the ground so that it contacts the inner half of the tire. Then remove the jack and jiggle the car until it drops off the pipe. If the wheel is not stuck too tightly to the axle, this method will usually do the trick although you may have to place the pipe under the wheel two or three times.

—John E. Neenan, Brush Prairie, Wash.

Pressure Lubrication of Springs



It is a simple matter to fix your car springs so that they can be lubricated between the leaves with a pressure grease gun. All you do is to remove the center spring bolt, flatten one side, and drive on a nut that carries a grease fitting as indicated.

After the nut has been tightened be sure that the end of the fitting is directly over the flattened portion of the bolt. Then drive on the regular nut and lock washer. When grease enters the

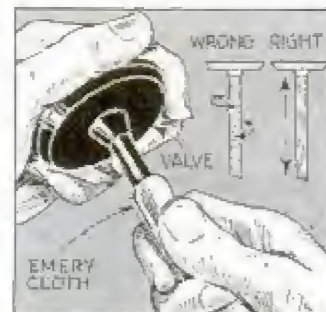
fitting it passes up the flattened portion of the bolt and is forced into the spaces between the spring leaves.

—C. E. Packer, Chicago.

Correct Way to Clean Valve Stems

When cleaning valve stems, use fine emery cloth and rub up and down the stem. If the abrasive is turned around the stem, it will make tiny grooves which soon will be filled with carbon, causing the valve to stick.

—James W. Clift, Columbus, Ohio.



Racing Motor Burns Bearings

A motorist who has driven his car 45,000 miles without undue wear, always warms up the cold motor at slow speed for two or three minutes before driving the car. This allows the congealed oil to reach the moving parts, which might burn or wear badly over a period of time if a cold motor is operated at driving speeds. Operate the motor as slowly as possible for the first 20 or 30 sec. and then speed it up until the ammeter just shows "charge."

Extra Cylinder-Head Gasket Stops Exhaust Blowouts

Persistent blowing out of cylinder-head gaskets caused by inequalities in the surface of the block or the cylinder head can generally be stopped by using two gaskets instead of one. The increased thickness of



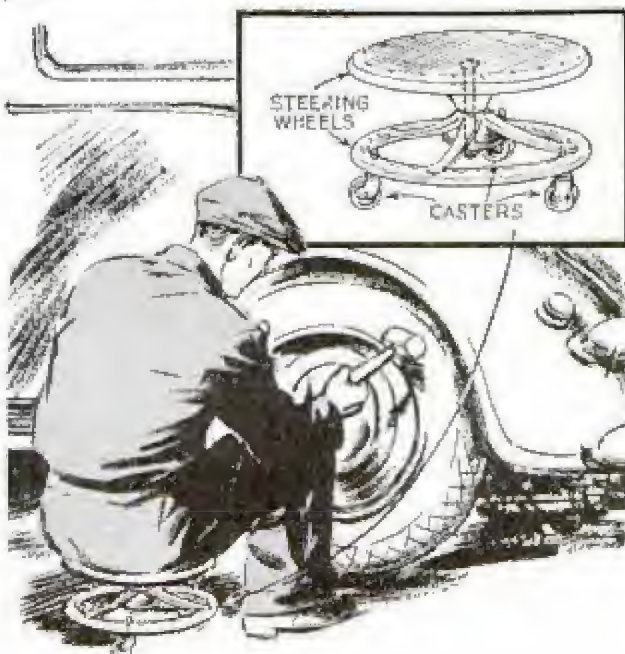
the extra gasket will lower compression slightly due to increasing the size of the combustion chamber, but this is usually not objectionable.

Testing Valve Seats with Pencil

Pencil marks offer a convenient means for testing newly ground valves for fit. About six marks are made across the seat at equal distances apart. The valve is then dropped into place and rotated backward and forward. If all the marks show breaks, it is reasonably certain that the valve has been ground correctly. Another method is to cover the valve seat with a thin coat of Prussian blue. The valve is then oscillated backward and forward about $\frac{1}{8}$ in., at the same time applying considerable pressure directly downward with the grinding tool. If the valve has been ground correctly, the blue will be wiped from the seat at a point near the center of its width, forming a continuous line completely around it.

Creeper Seat Handy in Garage

When working on car tires and brakes, a garage mechanic uses this creeper seat, which enables him to sit while working, yet move to different positions as required. The seat consists of two steering wheels fastened together with a bolt. Canvas stretched across the upper wheel and tacked to the rim forms a cushion, while casters on the lower wheel permit the user to move the seat.



Taper of Cylinder Measured with Feeler Gauge



Cylinder taper can be measured with a fair degree of accuracy with a feeler gauge and a length of small steel rod. File off the end of the rod until it will just hang crosswise in the bottom of the cylinder where there is practically no wear. Then put it in the upper part of the cylinder a fraction of an inch below the top of the piston-ring travel, and insert a feeler-gauge blade that will just cause it to hang there. The thickness of the blade is the amount of taper.

Cotter Key Aids in Repairing Tire

To release the air from an inner tube, bend the tip ends of a cotter key and use it in the valve stem as shown. A cotter key bent as in the right-hand detail is handy for opening punctures for quick release of air.



Spotlight on Air-Hose Standard Helps Motorist Check Tires

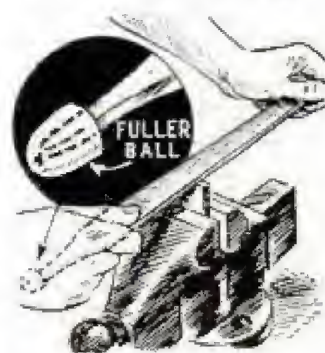


When the free-air hose is located near the curb or where illumination is poor, a

spotlight fastened to the standard will enable a motorist to direct the light as needed for checking tires. The light socket will have to be changed to take a 110-volt bulb and the reflector opening at the rear end will have to be enlarged somewhat to make room for the larger bulb.

Fuller Balls Protect File Tangs

If you are in the habit of using files without handles, you can avoid possible injury to your hands with the sharp tang ends by slipping fuller balls over them. When using a file, the ball rests against the heel of the hand, forming an effective shield over the end of the tang.



Dutch Windmill Rotates Slowly in Breeze



Simplified Design: Stands about 5 ft. high and is built of standard lumber stock. Construction requires a minimum of work and only a few ordinary hand tools are needed.

Additional Purpose: Besides the purpose of ornamenting your garden next season, this windmill will serve splendidly as an outdoor doll house for the little tots. To this end the doors may be real ones, hinged in place, instead of being only painted imitations. Colorful dolls in quaint Dutch costumes, set on the balcony, greatly increase the realistic effect.

Craftplan Tells How: All information on building this windmill in your workshop is contained in our Craftplan No. 3012. Besides the drawings that give all sizes and show the assembly, instructions tell just how to proceed step by step. A material list is also included. Just fill out the coupon and remit ten cents upon receipt of which the Craftplan will be sent to your address.

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YOU
NEED . . .**



Every Policeman a "G-Man"

(Continued from page 725)

his meager evidence, but the prisoner denied any knowledge of the broken pane. He was convicted of the attempted burglary, when ultraviolet rays revealed minute particles of the same type of glass in the dust in his trouser cuffs, and on the head of the spike used to break the pane.

A patrolman solved a dozen burglaries by photographing the print of a crepe rubber sole on a dusty piece of linoleum.

This is the sort of scientific detective work one expects of G-men, or the super-sleuths of fiction. But when run-of-the-mill policemen in your city solve crimes by these methods, it comes as a pleasant surprise. To the criminal it is a distinct shock.

Milwaukee isn't the only city to benefit by bureau of investigation instruction. Captain of Detectives John A. Taylor of Fort Wayne produced conclusive evidence by trapping a burglar into photographing himself in the very act of stealing. This burglar had ransacked a house nine times in sixty days, each time raiding a cabinet in which money was kept. Captain Taylor removed a knob from a bureau drawer on the opposite side of the room, and focused his camera lens through the hole, connecting the shutter release to the cabinet door with a fishline, and synchronizing a flash bulb with the camera, so that opening the door would explode the flash and trip the shutter.

While some cities like El Paso, Milwaukee, Newark and Detroit, have established well-equipped training schools in which their Academy graduates may instruct their brother officers; other graduates have accomplished wonders on little more than their own enthusiasm.

Detective Arthur Thalacker of the Westchester county (N. Y.) parkway police set up a training school in his own home, in which he is instructing police from adjoining cities. His initiative brought him the job of chief of police at Burlington, Vt.

Lacking funds even for a dummy for his crime-scene searches, he made his own from the wax head of a clothing dummy. Using long winter underwear, Thalacker poured plaster of paris in the arms and legs, stuffed the body with straw and old newspapers.

Harold J. E. Gesell, an Iowa sheriff, re-

cently solved a hog-stealing case by infrared photography on the discarded sideboard of a truck, which made legible faint traces of pencil writing not otherwise decipherable.

Undoubtedly the great success attained by the Academy is due to the interest and enthusiasm aroused in the students. There is little of the dry, booky atmosphere of the classroom. There are lectures, of course, but they are lectures by men with practical experience in the most thrilling game of all—the man hunt.

And the lectures are liberally spiced with actual investigation. There is the crime-scene room, containing "Oscar," the oft-murdered dummy, and a goodly sprinkling of clues. Student officers are turned loose in pairs to investigate and reconstruct fictitious crimes, while a veteran instructor supervises and criticizes their work. There is "Beulah," the ancient chariot, which students search for fingerprints, on which they study the technique of the auto thief. And there is the "rogues' den," which may simulate the appearance of a hideout for kidnapers, bank robbers, and any type of criminal. It always has been hurriedly deserted by its occupants, whom the students must identify from clues left behind.

In the classroom there are magnetic blackboards, on which students obtain "skull practice" in the technique of raids. Here outlines of streets or roads are sketched. Miniature houses, trees, hedges, autos, men—all highly magnetized—are placed in position to represent the scene of a raid, the whole appearing as an aerial view of the terrain.

Slides and sound movies illustrate the lectures. One film describes "The Technique and Mechanics of Arrest and Search of a Person." Others explain scientific crime-detection methods, proper and improper methods of conducting an investigation. There is a laboratory in which the students may go about the scientific analysis of evidence. Each year a "refresher" course is given, to which Academy graduates may return for ten days, to learn of the latest developments.

The ultimate aim is to make every law-enforcement officer a trained and efficient investigator—every policeman a G-man.



WHEN A
MISS MAKES
A HIT
...why don't YOU
give him



Velvet
*Better
smoking
tobacco*

- for **MILDNESS**
fine old
Kentucky Burley
aged in wood
- the **FLAVOR**
of pure maple
sugar for extra
good taste

*Velvet packs easy in a pipe
Rolls smooth in a cigarette*

*Better tobacco
for both*

8 728 "Disaster College" for Sea Captains

(Continued from page 715)

estuary of San Francisco Bay. The "Tusitala" and the "Joseph Conrad," both full-rigged sailing ships, are being used as well as Coast Guard cutters for training cruises. The steamer "American Seaman," with quarters on board for 225 students, serves



After deck of "Northland" which is used to complete training of seamen and officers

both for practice and as a floating schoolhouse. In addition to its ordinary ship's gear the vessel contains an auditorium, large class rooms, and workshops. On the west coast the large cutter "Northland" is used in training. The schools on both coasts have a total student capacity of 272 licensed officers and 2,980 unlicensed seamen per year. Coast Guard and merchant marine officers serve as instructors.

Due to differences in age and experience of the students, attempts are made to give separate instruction to small groups so that each man will benefit fully from the course. Unlicensed men in four divisions, seamen, firemen, stewards, and purser's departments, are all given separate lessons aside from standard instruction in boatmanship, laws, hygiene, and traditions that all receive. Stewards learn cooking, baking, cost accounting, routine of waiters, diet, and first aid, while firemen learn electricity, Diesel machinery, steam, upkeep of hulls and boilers, and similar subjects. Officer students get theory and mathematics as well as practical work. Deck officers

study the latest navigation methods, ships' papers, and naval construction, while engineer officers are coached in boilers, safety precautions, and instruments.

Officers are reminded that they can't load heavy cargo on upper decks with lighter cargo below, nor can they allow large surfaces of free water to gather in the bilges, because such bodies of water may act similar to pendulum weights and reduce stability.

At the same time that the Maritime Commission is training the seamen who are serving today it is planning a co-ordinated program of instruction for young Americans who wish to follow the sea. Most of the leading maritime nations have elaborate training systems for manning their merchant fleets and in some foreign schools boys fifteen years old or younger are admitted. From one British sea school alone 13,000 boys have graduated since 1918.

In the future the Commission hopes to enroll 500 apprentice seamen per year for a one-year training course that would fit them for service in the merchant marine. Young men between eighteen and twenty-three years of age would be eligible and they would receive clothes, food, and quarters as well as twenty-one dollars per month while in training. The schedule calls for three months at a shore training station, six months on a training vessel, and three months on a Coast Guard cutter.

All American ships that carry ocean mail are required to ship a few cadets and cadet officers. In the revised cadet system some 300 men under twenty-five years of age are enrolled for four-year periods, during which time they receive training in ship duties, and courses of instruction.

Eight universities have established Naval Reserve officer training units, graduates of which receive commissions as ensigns in the United States Naval Reserve. Massachusetts, New York, Pennsylvania, and California maintain nautical schools that turn out a total of about 200 graduates yearly, the California students living aboard ship while they are enrolled. A number of vocational high schools are beginning to offer courses in seamanship, now that it seems that there is going to be a need for more trained men to man and officer our growing merchant fleet.

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Doing It the Easy Way

(Continued from page 698)

Every time an airliner goes out on the run it flies on brand new spark plugs, or others just as good. There are a lot of spark plugs on a dual-ignition fourteen-cylinder radial motor, so keeping them in tiptop condition is no small item. A good man used to take care of about seventy-two in a day, doing the job by hand. The first of these devices is a lathelike affair operated by an electric motor that cleans and polishes the center



A mechanic rigged up this arrangement for pumping oil into the tanks of an air liner

electrodes at one quick contact. The second works something like a drill press to set the four-way point clearance gaps to a uniformity and precision never before attained and without any feeler gauge either. Finally, the overhauled and assembled plug drops into a cutaway casing for test. When the operator throws his switch and the blue sparks fly, a blast of compressed air is directed against the plug at terrific pressure. If the plug stands up, doesn't leak or the spark falter, you can depend on it delivering the goods 10,000 feet aloft.

A mechanic at the American Airlines hangar has rigged up a device worked by compressed air which automatically lifts spark plugs into a testing machine in a split second where before they had to be screwed in and then unscrewed.

Ever try to wrestle a 400-pound oil drum into a usable horizontal position on a bench? There's a man in the United hangar who didn't like the idea either, so he rigged up a clever leverage device made of welded tubular steel and a piece of chain to do the job.

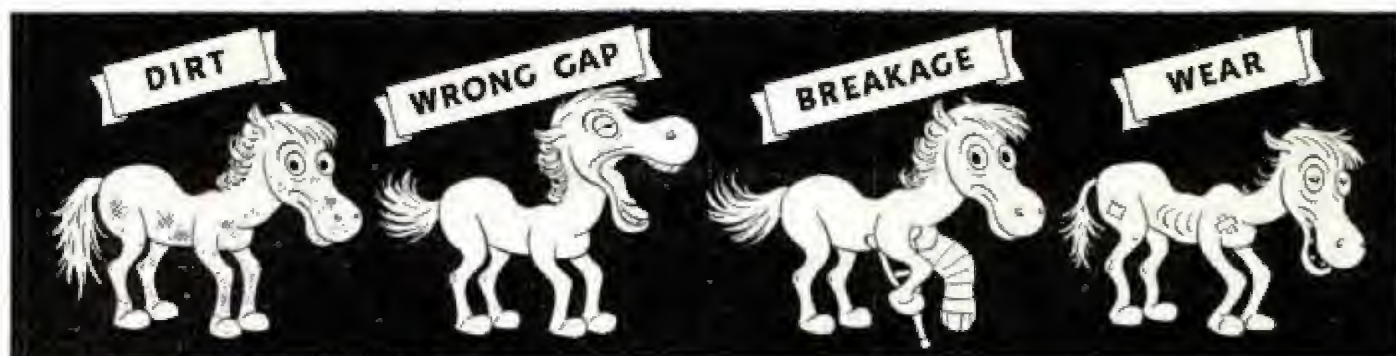
For wrangling a huge airplane tire off its hub rim, the hangar boys designed two devices, one utilizing leverage, the other the screw principle.

Nobody can see around a corner, you say, but American Airlines mechanics manage to do this very thing, with nothing more than an ordinary flashlight and a dental mirror. For inspection of inaccessible nuts, bolts and fittings in dark and difficult places, you can't beat this method.

If you have ever visited a modern transport terminal, you may have watched the small rubber-tired tractors snaking those big planes around. They are mostly towed by the tail although there are times when there isn't sufficient room in a crowded hangar. That's when United's superintendent, Homer Razor, figured out a clever push-pull rod.

In the TWA hangar another two-man job with divided responsibility was reduced to a one-man task by the straight thinking of a resourceful mechanic. This involved testing the air-speed indicators, a most vital check because instrument navigation would be impossible without accuracy here. One man had to stand on the ground under the plane nose to work. He was the helper. The man who had all the responsibility worked up in the pilot's cockpit, sixteen feet above. He could never be absolutely sure that the chap below was making his tests on the two instruments exactly the same. So, he worked out a way by which he could do the entire job himself from the cockpit. He rigged an air hose down to the air-intake hanging beneath the fuselage outside the ship. Then he connected this to a T which, in turn, was hooked up to his accurately calibrated test instrument and to the two air-speed indicators on the dash. By blowing through the hose, thanks to the T, he registered the same pressure on both indicators and synchronized them perfectly.

(Continued to page 120A)



ONLY 4 THINGS CAN HAPPEN TO ANY SPARK PLUG

and the Cure for Most Troubles
Costs only 5c a plug

DIRT is the most common cause of spark plug trouble.

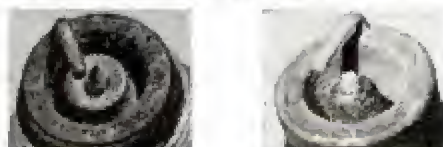


If the deposit is black, it's carbon or soot. If it is red, white, fused, or blistered, it's oxide — a residue of combustion.

THE CURE is a thorough cleaning (5c a plug) in the special machine developed by AC engineers. You will find this machine in service at more than 70,000 Registered AC Cleaning Stations. You can identify them by this sign.



WEAR is next in frequency. It is reasonable to expect about 10,000 miles of service from any standard make of plug. (Cleaning and adjusting are needed, of course, at 4,000-mile intervals.)



THE CURE is a new plug, or a set of new plugs. And you can't go wrong if those new plugs are AC Quality Spark Plugs.

WRONG GAP is related to wear.



Wear causes this condition. Sometimes, although rarely, gaps widen too quickly. This indicates that the plug in use cools too slowly, or is of the wrong type.

THE CURE for normal wear is gap adjustment with the special AC tools with which Registered AC Cleaning Stations are equipped. Accuracy is assured by a special gauge which conforms to the arc of the worn gap. Adjusting is a regular part of the AC Cleaning Service. The cure for abnormal wear is a new plug of correct type and temperature range. Better make it an AC.

BREAKAGE is the fourth trouble.

A broken upper insulator is always the result of a blow, as when a wrench slips. A broken lower porcelain results from attempting gap adjustment by bending the center electrode; or from use of a plug which cools too slowly or is of the wrong type.

Breakage is very rare.

THE CURE is a new plug.

May We Point Out —

A visit every 4,000 miles to your Registered AC Plug Cleaning Station will keep your plugs in good condition. Dirt will be removed before it can cause serious gas waste, power loss, and starting trouble. Gaps will be kept in adjustment. Wear will be eliminated when it becomes pronounced. Breakage will be remedied.

Plug cleaning is a splendid 5c habit. It will pay for itself many times over.





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(Rip saws slightly lower)
 Also Hollow Ground,
 \$3.00 to \$5.00

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and the Hint of the Month

Trimming inlay picture with "square board" made of $\frac{5}{32}$ " plywood, with a strip to fit table slot clinch-tacked to bottom, and with cross pieces squared to saw.



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Completely revised Disston Saw, Tool and File Manual. 48 pages, contains a number of hints like the one above. Tells how to choose saws; to joint, set and sharpen saws; and uses of other kinds of tools. Many illustrations.

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2707

(Continued from page 118A)

There are any other number of inventions around a hangar to save time, money, hard work and tempers, such as rigging up giant mop pails, wringers and other cleaning paraphernalia on wheels for quick and efficient portability; more powerful motors and larger dust containers for the vacuum cleaners used on plane interiors; ingenious welded steel towers and platforms to work on instruments high in the ship's nose, with small wheels for mobility and crank jacks to keep them from rolling when placed; trucks to carry tools and equipment used for under-carriage grease jobs; air-hose carts that can be wheeled all over the shop and connected from a dozen outlets, and all sorts of special tools, not on the market, for special jobs.

One of the most ingenious devices is the arrangement worked out in the TWA hangar to install new shock-absorber bands in a Douglas landing-gear retraction system. A full set of four rubber cords on each wheel exerts a maximum pull of 4,200 pounds. Since they must be installed taut far inside the wheel nacelle where working space is exceedingly cramped, you can see what a problem this might be. First the rubber bands are stretched some ten inches with an ordinary chain hoist or set of blocks-and-tackle. Then an iron bar, about two inches in diameter and notched at both ends, is placed inside the bands. The notched iron bar, slightly longer than the bands actually need to be stretched, is then carried into position in the nacelle, where it is a relatively simple matter to slip the strands off the bar one at a time to the retracting mechanism.

You have the same sort of problems around your own home. As you can see, solving them is just a matter of brains and common sense. The things outlined are merely examples of what goes on every day at scores of airline hangars, maintenance and repair shops at dozens of airports all over the country. They suggest how easy it is to be practical if you'll only do enough thinking on the subject.

☞ Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

Atlas

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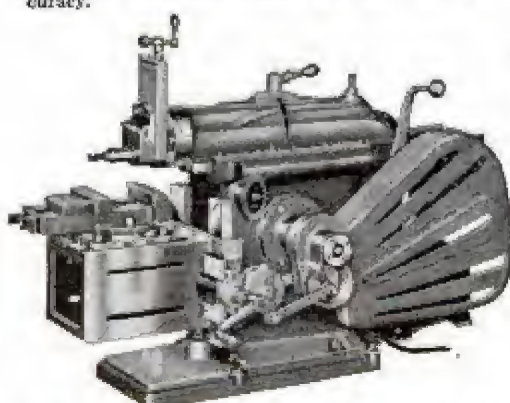
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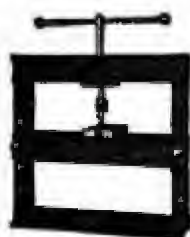
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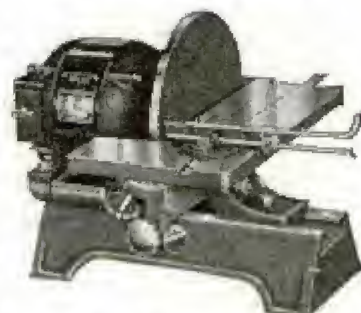
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Explorers of Space

(Continued from page 683)

old and feeble, due to loss of solar energy, and sending out less radiation than it does now—or sending out more, resulting in drastic climatic changes on earth accompanied by violent hurricanes, thunder, lightning and torrential rain. Before this happens, the sun may explode and from their observation point the witnesses of this drama of the skies see how the sun, from being a steady beacon in the heavens, suddenly transforms itself into a blaz-



Photograph of moon taken through Mt. Wilson telescope shows vast plain known as Mare Imbrium

ing blowtorch which sends waves of terrific heat far out into the solar system, destroying all life on earth. Other theories, too, are depicted, dealing with the potential destruction of the earth, such as a head-on collision between the earth and a comet, or the earth being sideswiped by a star.

Another climax of this drama is the destruction of the moon. Here the observers see the moon being dragged toward the earth by the latter's pull of gravity. This cataclysm, which also might take place millions of years from now, will disrupt, if not entirely destroy, life cycles on the earth. As the lunar body is pulled relentlessly toward the earth it suddenly may break under the tremendous strain. Chunks of the moon may bombard the

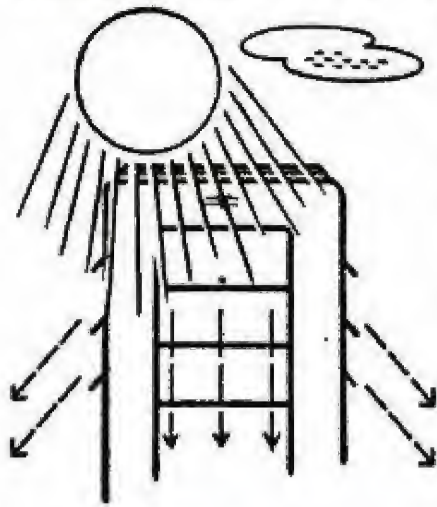
world, accompanied by volcanic outbursts and earthquakes, until finally the life-less world is surrounded by a ring such as that which girdles Saturn. In the case of the earth, however, the ring would be made up of moon particles.

According to Professor Barton, there are two types of destiny which may await the earth. One is the "fixed" or "certain" type, the other is the "accidental." Scientists know that the cooling of the sun would bring the ice age back to the earth and that each second, four million tons of sun stuff are burned up on that body which is 864,000 miles in diameter. They know, too, that when the moon is pulled by gravity to within about forty per cent of its present distance from the earth it will start breaking up. With knowledge of this type, they have been able to compute "certain" events of this kind, hazarding guesses as to when they may take place. These events, they tell us, are millions of years in the future, hence are nothing for us to worry about.

The "accidental" type of events, however, possesses more potential danger in our own lifetime. Just a second ago—as astronomers regard time, on October 30, 1937, to be exact, a small heavenly body, Hermes, charging through space was only 400,000 miles from the earth—a tiny distance in the immeasurable universe. Observers estimated that it probably did not measure more than a mile in diameter or weigh more than 3,000,000,000 tons. If it had hit the earth, traveling at tremendous speed, however, it would have done an incalculable amount of damage. So might any comet shooting down in the path of the earth and either sideswiping it or meeting it head-on. Even here, however, the explorers of space offer us some measure of consolation. The universe is so big, they point out, that the millions of heavenly bodies which occupy it, numerous as they seem, are really few. The space they take up might be compared to five small birds on earth, each flying over a different continent. The chance that two of those birds would have of colliding is pretty remote.

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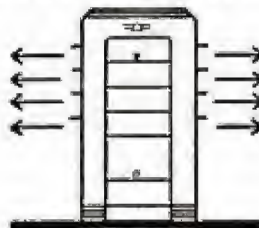
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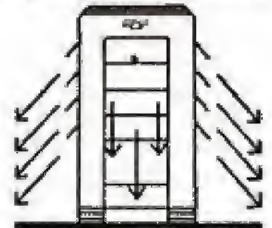
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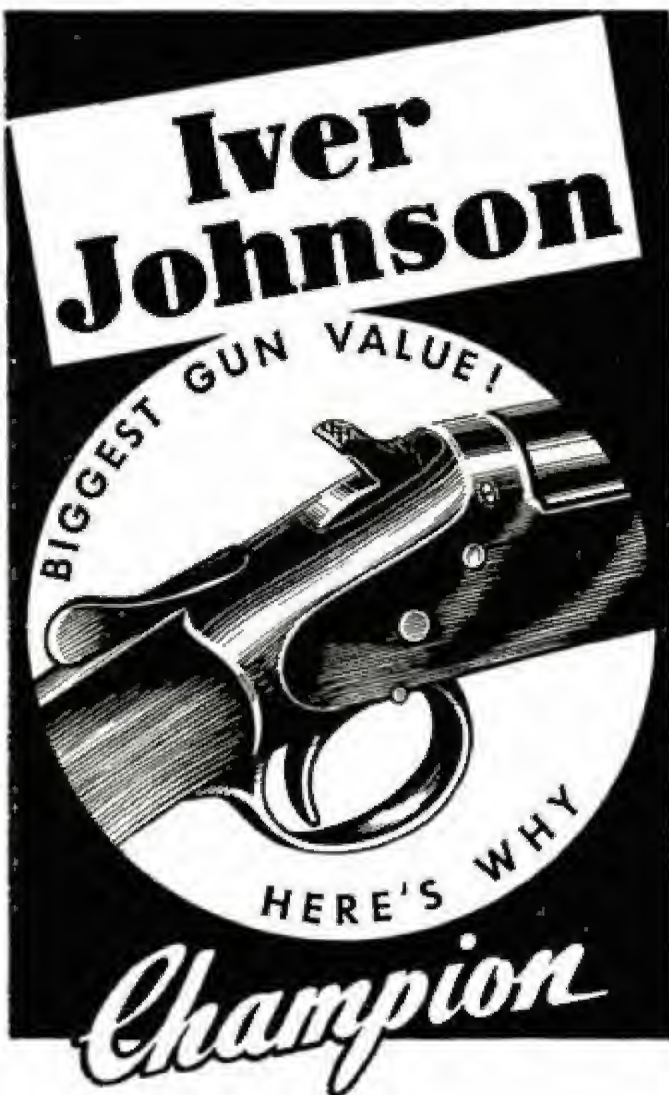
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(Continued from page 677)

quickly on his exhaust valves, he shoots to the surface like a rocket, in immediate danger of the bends unless he gets under pressure again in a hurry.

The "blow-up" of a diver on the "Squalus" job shows how it happens.

This man, one of the crack divers in the navy, was down on the deck of the "Squalus" attempting to shift an air-hose connection to the main ballast tank aft, over the four flooded compartments where the bodies of the twenty-six victims still awaited release. He struggled with the hose for fifteen minutes, punch-drunk and groggy under compressed air.

He found the salvage connection broken. He could make no progress with his job.

"I can't get anywhere and I'm having plenty of trouble in staying down here," he reported through his telephone. "I can't get enough weight on me."

Lieut. Commander Charles B. Momsen, diving officer of the rescue ship "Falcon," glanced at the clock and called to the diver that his time was up.

"Okay, I'm at the descending line, ready to come back," the answer came up.

"Come up to ninety feet and wait for the diving stage," was the next order from the deck.

The seconds rolled by as the diver reported himself "okay on the line" . . . "okay at ninety feet."

A few more seconds passed. All hands on deck remained silent, awaiting his report that he was on the stage.

Suddenly the gurgle of escaping air, bubbling alongside the "Falcon," became a loud sputtering.

He had "blown up!" His lines trailed in crazy curves atop the water. He floated to the surface, leaping up like a jack-in-the-box. A faulty twist of the control valve had forced more pressure into the "hat" and left him helpless for the moment.

Momsen leaped to the port rail, making a quick survey.

"All right," he called calmly as the line tenders hastily pulled in the slack. "Tell him we'll tow him back to the descending line."

The telephone man repeated the order to the loudspeaker system. The diver now had his air under control and was holding

2 806
himself at surface level with head up and feet down.

The lines hauled him over and he reached out for the hawser to the sunken submarine, gripping it with his right hand as he reduced the pressure enough to give himself negative buoyancy for the slide down to the ninety-foot decompression stage.

Through each move of decompression, he was given double time. Nitrogen bubbles always run a close race with a "blow-up," and it is a fortunate diver who gets back under pressure quickly enough to save himself the tortures of the scourge of those who salvage "pig boats."

This man was lucky. His number wasn't up.

Raising and refitting the "Squalus" costs far less than a new ship, for navy personnel has to be paid and the salvage ships must be kept in operation whether or not a submarine lies on the bottom, and the only added cost borne by the government is for materials. Refitting the raised submarine will cost about \$1,000,000 against \$4,000,000 for a new submarine.

The lessons learned by the navy in its salvage of the "S-51," and then the "S-4," proved conclusively that the pontoon method of submarine salvage is by far the most satisfactory and the most practical. It is possible, under some circumstances, to attach salvage air hoses to the various ballast and fuel tanks and literally blow the vessel to the surface, but this is awkward and dangerous at best, and almost out of the question if the submarine is sunk more than 200 feet.

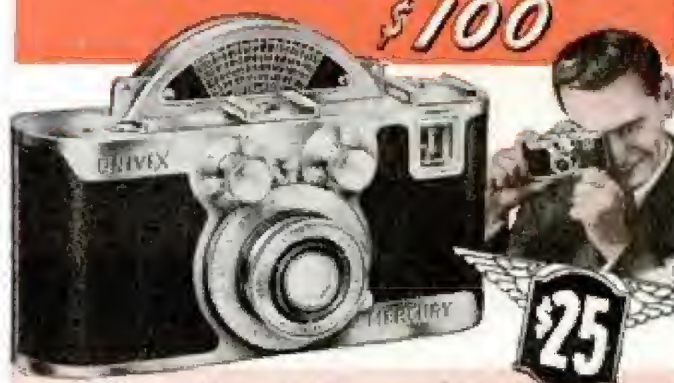
The salvage pontoon operates, in effect, on the principle of the submarine. Flood it with water to make it sink; blow out the water and fill it with pressure air to make it rise. pontoons are expensive, averaging \$15,000 each. The larger ones, which average thirty-four feet in length, have a lifting power of eighty tons—the amount of water they displace.

In the salvage plan for the unprecedented underwater tow of the "Squalus" to shallower bottom, ten pontoons were used, six on the stern, four on the bow. In the first attempt, which resulted in the accidental surfacing of the bow, only two were placed over the bow, five over the stern.

The top layers of the pontoons—three at

(Continued to page 126A)

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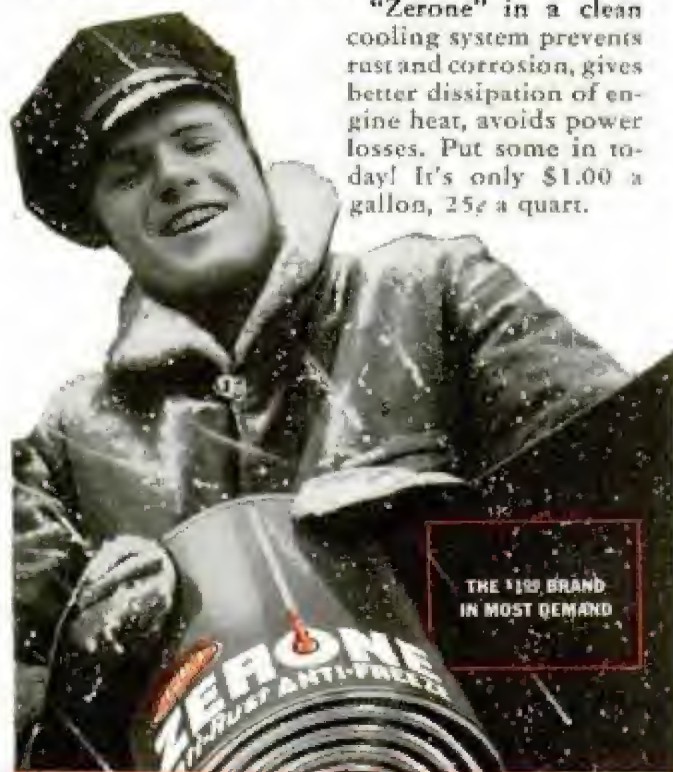


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(Continued from page 125A)

a depth of eighty feet over the stern, three at seventy-four feet over the bow—were placed at those levels so that when they rose to the surface the submarine would be hanging underwater at an even keel, ready for the first tow. Astern, one pontoon was dropped to 160 feet for the first shift and thus was in its proper position for the second lift. The remaining pair was at the 230-foot level. The difference in depth for the second lift was due to the slope of the ocean bottom.

The whole plan of underwater towing was evolved for its first use in salvage history because of the depth in which the "Squalus" landed. If she had fallen in 100 feet of water it would have been a simple matter for the navy's deep-sea divers to attach pontoons directly to the hull and bring the ship all the way to the surface and into drydock. But at 240 feet, a diver has little working efficiency, little more than half an hour of bottom time.

On paper, the theory of blowing the submarine's ballast tanks and bringing her to the surface by herself looked very well. Actually, it might have meant the destruction of the vessel. The "Squalus" might have rocketed to the surface out of control, in danger of bursting its hull from the inside force.

The plan was to tow the "Squalus" stern-first, since the stern was headed toward shallower ground, and toward the Portsmouth navy yard. One heavy tow line went down from the mine-sweeping tug "Wandank" to the stern of the "Squalus." Another "Wandank" hawser went to the bow of the "Falcon." Astern, the tug "Sagamore" held a preventer or safety line to the bow of the submarine, holding enough strain to keep the "Squalus" from yawing. Thus the "Wandank" towed both the "Squalus" and the "Falcon" at the same speed. It was obvious that the "Falcon" must keep an exact pace with the "Squalus," to prevent the air lines from tearing away.

Once in shallower water, the navy could uncross its fingers and send down the divers for what amounted to child's play after the 240-foot depth of the original position.

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Shooting from the Clouds

(Continued from Coloroto Section)

I direct my own pilot and the pilot of the object ship by radio, talking into a lapel microphone and listening with a headset. That makes coordination easier, and if the other fellow sticks his wing through my door I can at least talk back and tell him what I think of him.

Part of my work is photographing celebrities at the airports and aboard planes. They don't all like it, and sometimes it takes plenty of diplomacy as well as ingenuity. I snapped one noted personage arriving on a flagship at Glendale, Calif., but he walked over, quietly took the camera out of my hands, pulled out the film, exposed it and handed it back. Once a flock of newspaper cameramen lined up to catch Doris Duke Cromwell as she stepped from a plane. I noticed the photographers were all on one side of the "gangplank," and I knew she would turn away as soon as she saw them, so I took a position alone on the opposite side. Sure enough, she turned her face toward me and I caught a good "grab shot." I sent Doris a print and she liked it so well she ordered two dozen copies.

Most gracious of all celebrities, however, is Eleanor Roosevelt. A veteran flier, she is invariably charming and willing to pose. By pre-arrangement she gave us forty minutes of her time recently at Fort Worth. We had every picture planned in advance. Chalk marks on the pavement showed her where to stand and indicated camera position. She posed in the doorway, in the cabin, eating, knitting, lying down in the sleeper. Lesser persons might have felt

silly or exasperated, but not Mrs. Roosevelt. She was game and cooperative, and in forty minutes I shot twenty-four good Kodachromes.

You'll never be bored as an aerial cameraman. There's something new every day. You may be called on to shoot aerial maps with a fifty-five-pound camera fixed in the floor of your ship; the government may want photographs of growing crops or erosion-control projects, of forest fires, harbors, fire and flood control and forestry conservation projects. Oil and mineral prospectors send you up to 10,000 and 20,000 feet for pictures of terrain that looks promising to them. Once I was sent on a jaunt through the bumpiest air of Arizona's mountain wilderness to hunt a lost gold mine, and between pictures I had plenty of time to wonder what would happen if we had to land. There wasn't a smooth spot the size of a postage stamp for miles. If anything went wrong we'd be as lost as the gold mine, which is still missing.

You run into such odd difficulties as having the camera shutter stiffen with cold 8,000 feet over Los Angeles. And one day when you're relaxing to enjoy the scenery after shooting the snowclad sierras through the open door, your plane will hit a bump, do a flipflop that all but puts your head through the floor, and then drop through a hole in the sky for a vertical spin. As the pilot pulls you out of it a half mile nearer the treetops you are wondering whether you remembered to put the filter on for that last Kodachrome shot.

Angling for Better Billiards

(Continued from page 693)

Firmness is the chief asset of this style of cue holding. The strong second or middle finger is curled under the thumb to provide a rest. Combined with the third and fourth fingers it forms a tripod with a large base that makes the hand as firm as if it were a part of the table when a steady pressure is applied. The first finger should be wrapped completely around the cue and the tip held under the thumb.

Don't make the common mistake of al-

lowing your index finger to go free; double it under the thumb so it will be held firmly. The parts of the hand that actually touch the table are the heel, the entire length of the little finger, the tip of the third finger, the first joint of the middle finger, and the tip of the thumb.

The masse bridge is a shot easily mastered by all. Assuming the player knows where to strike the cue ball, its secret lies

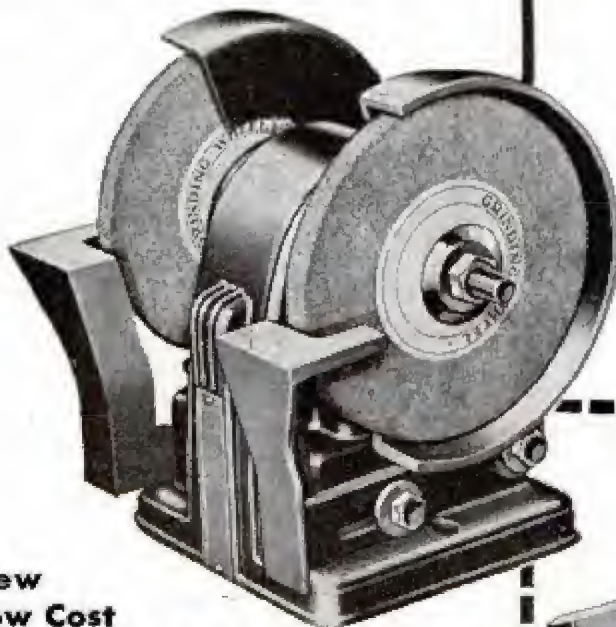
(Continued to page 130A)

New Delta Shaper

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Once again Delta announces a big step forward in power tool design—a basically improved shaper built to the same high standards that characterize all Delta Machines. Here is a powerful, smooth-running, accurate tool that gives you heavier, faster cuts than the ordinary light shaper. It will shape, form or mould any form of work from the smallest mouldings to heavy production work.

Some of its new features are: 1. *Large Husky Spindle*; 2. *Exceptionally Big Table*; 3. *Long Spindle and Spindle Travel*; 4. *Large Sealed-for-Life Bearings*; 5. *Powerful V-Belt Drive*; 6. *Interchangeable Spindles*; 7. *Fully Adjustable Fence*; 8. *Strong, Welded Cabinet*. Every man interested in power tools should get the full details on this remarkable machine.



New Low Cost Delta Grinder and Buffing Head

Has 6" x 1 1/2" wheels, easily removable cast iron guards, adjustable tool rests and a quality heretofore not found in low-cost grinders. May be driven from back or bottom. New Delta Buffing Head is similar to grinder except that guards and rests are eliminated. Has 1/2" threads so that many standard attachments can be used, such as scratch wheels, wire brushes and chucks.

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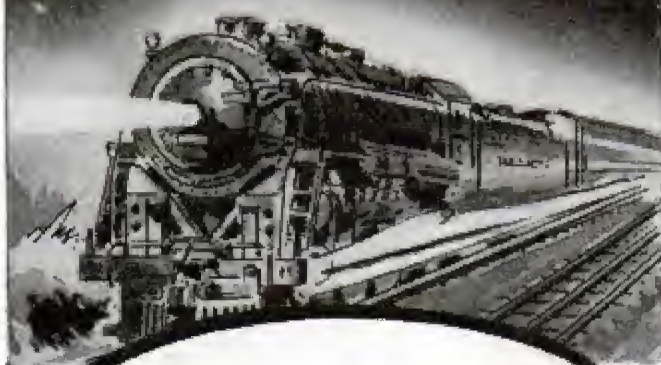
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(Continued from page 128A)

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in having each of the four fingers of the bridge hand pressing against the bed of the table. Likewise, a bridge for a half masse over a ball can be made as firm as one for a regular masse. Miscues are common when the player fails to provide a steady rest for the cue. Many players have a tendency to strike the ball too low, whereas it is necessary to strike only a fraction below or behind the center line to obtain immediate response. Essentially the bridge is the same as for the ordinary masse except that the angle of the cue is lower.

Fully ninety per cent of the shots made with the cue ball close to the rail are accomplished with the cue almost level. Elevation is necessary only in the half masse strokes.

The rail bridge is a solid support in which the first and second fingers press gently against the cue to form a slot through which it slides easily. The matter of elevation is easily regulated. The top surface of the cushion acts as a guide with the cue resting flat upon the cushion, which, of course, is a slightly beveled edge.

A good player, in cuing, never strikes more than one half to the right, left, top, or bottom of the center of the cue ball. A player's progress will be rapid if he refrains from using english as much as possible. Playing too far to one side or the other creates miscues and faulty shots.

The importance of a good follow shot may be grasped when you consider how many opportunities in ordinary straight rail, balkline, or pocket billiard game fall under this classification. The idea is to make the cue ball follow in the general direction of the object ball with which it comes in contact. In carrying out this shot, never cue more than the width of your tip above center with no english and make certain your bridge is at such a height that the evenness of your stroking is not impaired.

There should never be any doubt in the player's mind regarding the exact spot on the first object ball which he must strike in order to effect his carom. For that reason we have arrived at a system that has proved successful in playing the follow shot. Draw a line from the center of the second object ball to the center of the first object ball. The point of aim is then the

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spot on the far side of the first object ball where this imaginary line cuts the surface. Whether the angle be narrow or broad, this method can be used. In other words, on a free follow or half follow the result will be the same; the half follow invariably will gather the balls where a fine shot scatters them.

In studying the draw shot we will see also that the player must be concerned with the point of aim, rather than the point of contact. The draw shot, incidentally, is the thing that separates the players from the dubs. Without a good draw shot, your chances for success in any form of the table game are zero. Many billiardists make the mistake of raising their bridge hand when they want to draw the ball. By doing this the follow-through is cut drastically and, apart from cutting down the back spin on the ball, there is a strong likelihood of tearing the cloth.

To determine the exact spot on the first object ball that must be struck to score the point is at times confusing to amateurs trying a draw shot. The simplest system is to divide the angle between the cue ball, the first object ball and the second object ball; then aim through center of cue ball at point on the object ball equal distance between two sides of a triangle. The process of dividing the angle with the eye may at first prove difficult but if the player gives his full attention to the system he will soon grasp the idea and thereafter will see the point of aim instinctively. Having determined exactly upon the point of aim, the player should take care to form a firm bridge. He should hold his cue as level as possible with a slight elevation at the cue butt. By striking the cue ball one half below center without english he will execute the shot.

The correct way to take aim is to select the spot on the object ball you wish to hit and the spot on the cue ball. Concentrate on this line of aim and then hit where you aim. Watch the tip of your cue in preliminary strokes to see that it is going to the same spot each time.

In conclusion, practice concentration on every stroke. Once you have determined the proper place to strike the first object ball with your cue ball, concentrate on your cuing and connecting with the first object ball and your game will improve.

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(Continued from page 777)

A simplified wiring diagram is shown in Fig. 2 and the schematic circuit diagram appears in Fig. 3. Photos Figs. 2-A, 2-B and 2-C show general views of the assembly.

A detailed list of the original materials used in the model can be obtained from Popular Mechanics radio department without charge. The blueprint, R-272, will not be available until Part II of this article appears in the December issue.

(To be concluded)

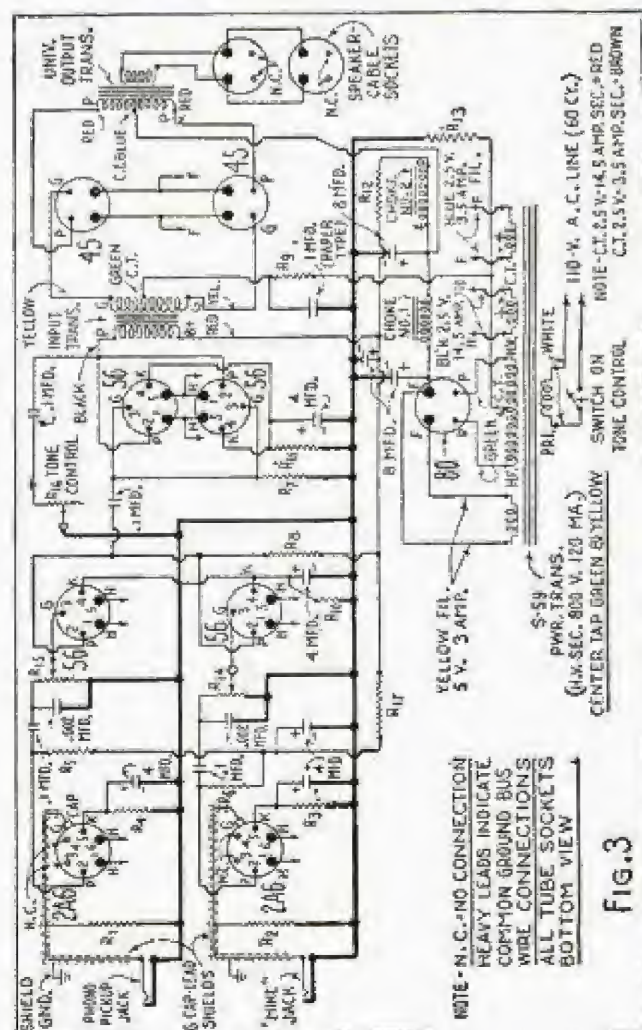
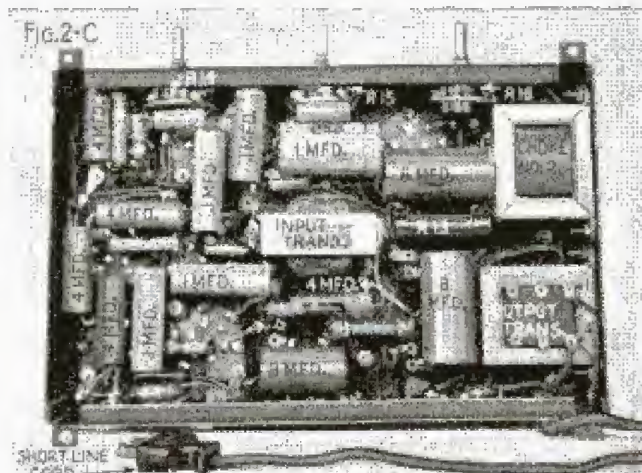


Fig. 3

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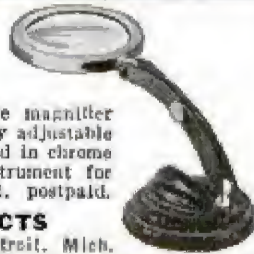
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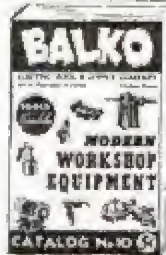
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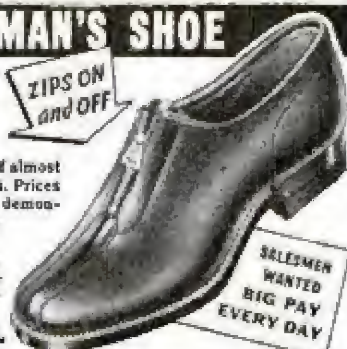
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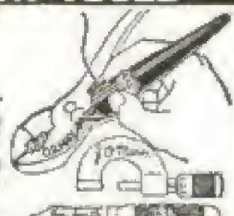
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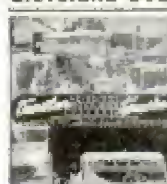
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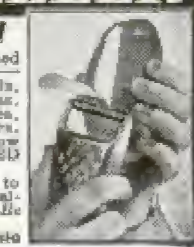
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(Continued from page 735)

find their nests; for when the home contains eggs or young, the occupants are sure to return and give you a chance.

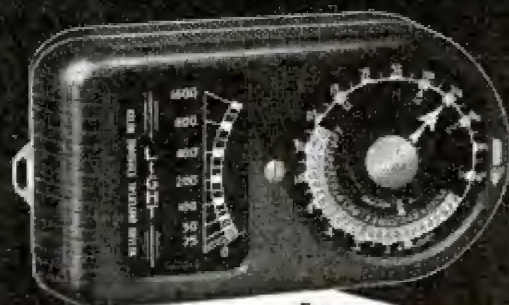
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Photographs at the nests of hawks and owls are won only at the expense of some rather strenuous climbing. The help of a friend or two is especially valuable here, for you cannot make a difficult climb loaded down with equipment. On climbing expeditions it would be wise to take along a pair of lumberman's spurs, a lineman's belt, a short length of stout rope, a hundred-foot length, two-hundred feet of binder twine, and a basket. Trees small enough to grasp with the arms may be climbed easily enough with only the spurs. On large trees, you use spurs and the short length of rope, which you wrap around both wrists after passing it around the tree. The approved technique is to take a step or two with the spurs, flip the rope up the trunk as far as you can, then lean back on it while you take another step or two.

Eggs and young may be photographed directly in the nest, though it is usually necessary to clear away a few leafy branches in order to get a clear shot with the camera. You should tie such branches back, allowing them to spring into place when you have finished. Never break them off, as this exposes the young birds to their natural enemies, and to sunshine, which will kill the young. To get a picture of birds being fed by the parent, it usually is necessary to rig up the blind and let it remain for several days, until the birds get used to its presence.

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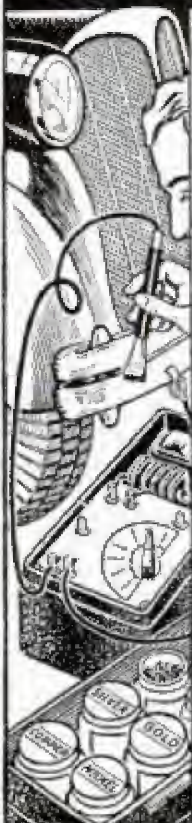
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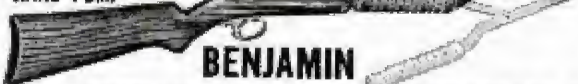
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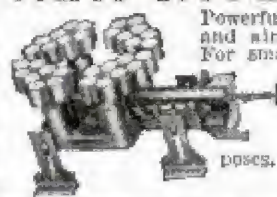
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Powerful Blue Flame from common kerosene and air. Cheapest heat known to science. For small boilers, vulcanizers, bake ovens, potato chip and doughnut kettles, pressing machines, etc. Adjustable from 8" to 14" diameter. Perfectly regulated flame. Also burners for cook stoves and many other purposes. Responsible distributors wanted. **HEAT APPLIANCE COMPANY** 1637 West Walnut Street, Chicago, Ill.

FREE "BETTER RESULTS WITH GLUE"



Send post card for booklet, "Better Results with Glue," containing many useful hints about mending, model making and home workshop jobs. Address: McCormick Sales Co., 402 Light St., Baltimore, Md.

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Metat Anchor, Steering Wheel, Lifeboats, Anchor Chain, Casks, Masts, Dowels, Lacquered and Cement.

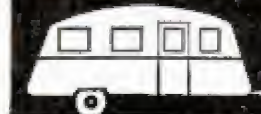
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Cards, stationery, circulars, tags, labels, advertising, etc. Save money. **Print for Others: Big Profits; easy rules** sent. Will do popular Inked Printing like Engraving. Junker outfit \$9. Sender outfit \$17 and up. Send for free catalog and all details. **KELSEY PRESSES, E-37, MERIDEN, CONN.**



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MARVEL TRAILER PARTS CO.

19020 Celestine Ave., Detroit, Mich.

Don't Take It So Hard

(Continued from page 709)

to the hospital may be welcome. What has been said about scrambling in other paragraphs goes double here. Bobby Brown, acrobat, says it's best to bump along until the final step is reached. Your trouser seat may become a little frayed but you won't get hurt.

The person who has the misfortune to fall from a scaffold or a windmill frame may find comfort, however small, in the fact there is frequently safety in height. Ask the aerialists, they know all the fine points about taking a painless dump. A number of performers would be alive today had they had more time in mid-air to squirm around in correct position for the fall. Before tackling any somersaults or feet-and-hands exchanges, the air stars get a complete education in how to fall. Their technique, Harold Genders of the Flying Harolds troupe, points out, consists in tucking up into a ball and hardening the muscles so the shock is eased.

If an aerialist were to drop feet first from a high swing into the net, he says, his knees would fly up and crack him in the chin or else he would land on his forehead. When he drops from the bar at the end of the swing he endeavors to land on his back with his elbows and arms in close.

In the big time acts, aerialists will frequently dive straight down for forty or fifty feet and never move until they are but three feet or so from the net. Then, in a twinkling, they will duck their heads, landing on their shoulders.

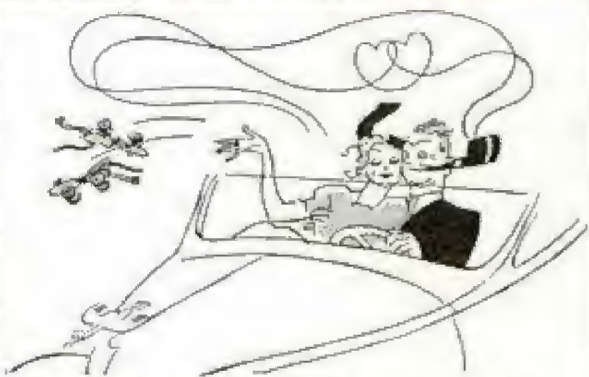
There's no greater safeguard against accidental injury than the ability to think clearly in an emergency, to size up the situation in a glance and act accordingly. The knack is not easily acquired but if you want to quicken your reflexes, performers advise your going in for competitive sports. The training you get in taking a cut at a curved ball, dodging a left hook, or returning a high lob where your opponent isn't will benefit you the next time a truck suddenly appears from nowhere and starts bearing down on you or you have a vague feeling the sidewalk is getting ready to whack you.

❏ Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

HOW HE MARRIED HER WITHOUT A SCENT!



AL'S NEW CAR won Peg's fancy, but his new pipe got her nanny—it smelled fierce! So on went her roller skates to head for home. Wait! Here's the postman!



HE TOLD AL to clean his pipe, and re-filled it with mild Sir Walter. Peg stopped to sniff, stayed to snuggle. The fragrant burley blend *always* wins! Try a tin!

New!
CELLOPHANE TAPE

around lid
seals flavor in...
brings-you tobacco
100% factory-fresh!



IT SMOKES AS SWEET AS IT SMELLS

TUNE IN—Sir Walter Raleigh "Dog House." Every Tuesday night, coast-to-coast, NBC Red Network.



FREE! Send for ALLIED'S
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**EVERYTHING
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at
LOWEST PRICES!**

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NEW

SETS

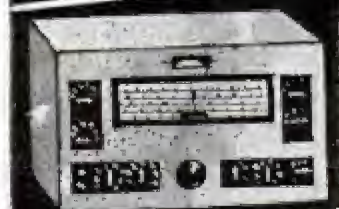
60 new Knight sets for every purpose—4 to 12 tubes, newest features, "Air Magnet," Genoloid Dials, etc.—latest portables 1-tube electric phonographs, 5, 7, 11-tube phono-radios—all sensational values! All priced amazingly low.



NEW

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15,000 radio items—everything in Radio in one big book! Parts for every purpose, tubes for all radios, latest books, tools, etc.—at lowest prices! Latest Test Equipment—Kider Volt-Ohmmeter, etc. Newest Kits, diagrams and projects.



NEW

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Complete Amateur Equipment—latest receivers, Sky Rider "Defiant," etc., Rotary Beam, Television Equipment, all standard lines—at lowest prices. Most complete Ham section in Radio. Investigate ALLIED'S convenient New Time Payment Plan!



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Send your new FREE 1940 Catalog.

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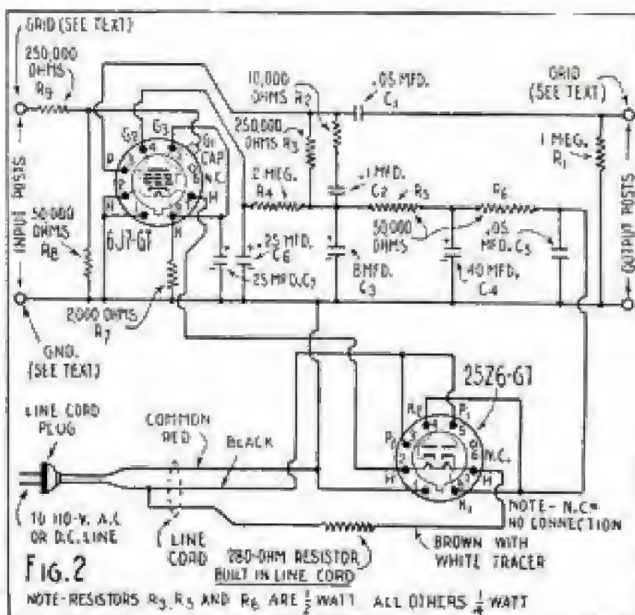


Electrical Substitute for Baffle

(Continued from page 778)

gain pentode circuit with a resistor divider network. The result is an even amplification at the regular audio frequency and a considerable increase in amplification (about 5 D.B.) at the extreme lower end of the audio band.

Only a handful of parts are required and these are all clearly shown, and the values specified, in diagrams Figs. 1 and 2. All fixed resistors are $\frac{1}{4}$ watt except R_3 , R_5 and R_6 which are $\frac{1}{2}$ watt. Thirty-six 6-32 machine screws $\frac{1}{2}$ in. long with hex nuts



and soldering lugs are employed to mount the parts on the pressed-wood panel, as shown in photos A and B. The unit is self-powered and operates on 110 volts either a.c. or d.c. with the 280-ohm line cord specified. The type 25Z6 "bantam" tube serves as the rectifier.

When used with a phonograph pickup and audio amplifier, the pickup is connected to the "input" terminals, and the output terminals are connected directly to the input of the amplifier itself. When employed with a radio set, the audio circuit can be broken at any point and the "electrical baffle substitute" circuit inserted. Ordinarily it is best to break the grid connection to the driver audio tube and connect the grid itself to the grid "output" terminal, while the grid lead previously connected to the tube should be fastened to the "input" grid terminal. The ground "input" terminal should be connected to the chassis of the radio set.

NOW! Anyone without experience can do a thousand and one **REPAIR JOBS!**

WELDING

**BRAZING
SOLDERING**

**QUICKLY
PERFECTLY
EASILY**

with
the

**NEWLY
INVENTED**

**3 in 1 Electric
TORCH**



COMPLETE WITH POWER UNIT—WORKS OFF 110 VOLT AC OR DC LIGHT CIRCUIT

Here at last is a portable machine that does real welding, brazing and soldering, yet is priced within the reach of all. The 3 in 1 comes to you complete with goggles, carbons, various types of welding rod and all accessories needed to do various repair jobs. It is all ready to plug in a light socket—nothing extra to buy. Simple instructions make it possible for you to do first class work easily without any previous experience or mechanical skill. The 3 in 1 instantly creates a terrific flame by just touching the carbons together.



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The 3 in 1 is ideal for auto body repairs and fender weld jobs—steam fitters, plumbers, sheet metal shops, engineers, maintenance men and janitors will find it indispensable. By following simple instructions, heavy work such as bumpers, tanks and industrial repairs can be done. Ideal for the countless jobs around a home or farm. **WORKS ON ALUMINUM, BRASS, COPPER, IRON, STEEL AND OTHER METALS.**

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for Burnt Wood Etching

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DEAL DIRECT — FACTORY PRICES
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Portable and battery sets \$8.98 up. Car sets \$11.75 up. Also consoles, all-wave etc. Samples at 50% off.
Send for FREE 1940 bargain catalog giving details of 10 day FREE trial and agent's proposition and discounts. No obligation, write today. **GOLDENTONE RADIO CO., DEPT. PM, DEARBORN, MICH.**

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Catalog**

New Adding Machine Fits Vest Pocket!..

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells to offices, stores, homes—wherever figures are used. Write quick for **FREE** sample offer and Money-Making Plan.

VE-PO-AD, Dept. 191, 303 W. Monroe St., Chicago



STUCCO MACHINE

Offers EXTRA EARNINGS

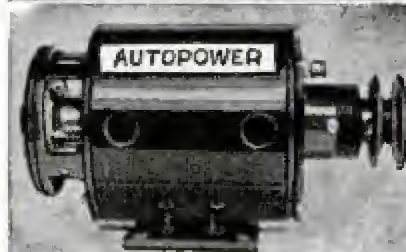


Renew old buildings. Make new construction more permanent and attractive. Plastic Colorcrete is waterproofed. It fused with any masonry surface. It fills all cracks. It can be applied in any thickness and in 30 colors. Fully proven by over 12 years actual use under all conditions and every climate.

OFFERS BIG EARNINGS

Owners everywhere want to enhance present values. With this machine you can supply this big waiting market with permanent Colorcrete at amazingly low cost. Operators report cost of 2c and up per sq. ft. and sell up to 7c. Some have paid for their equipment from first few jobs. Machine capacity up to 1,000 sq. ft. per hour. Get the facts. Send for the books, "Proven Business Opportunity." Write today. It offers you big extra income.

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AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts; for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. **INSTRUCTIONS FOR BUILDING AN A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS.** Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only \$1.00 postpaid.

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MOTOR MADE
BY GENERAL
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Use the Streamline for grinding, carving, drilling, polishing and many other operations when making models or for decorating purposes and etching in the workshop. The Streamline is also ideal for delicate, precision work in the tool and die room.

It is perfectly balanced, compact, light in weight and fits the hand without causing fatigue. It weighs only 12 ounces and is only 8 1/2 inches overall.

The abundance of power developed—over 17 watts output—and the high speed of 24,000 R.P.M. gives a smooth, finished cut on all types of work. Send for free descriptive literature or send for the Streamline on our ten-day trial money back guarantee.

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The Manufacturers of America's Finest and
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MORE POWER
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HEAT for **1 1/2**¢ per hour
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BURNS 96% AIR
only 4% FUEL

can have Radiant heat at 1 1/2¢ an hour. No obligation. Send now.
AKRON LAMP & MFG. CO., 1201 High Street, AKRON, OHIO

AMAZING new Radiant Heater.
Makes its own gas. No piping, no installation. A few pints of cheap liquid transforms ordinary air into many hours of clean, healthful, penetrating heat like sunshine, for 1 1/2 cents an hour. Hotter than gas or electricity, at **one-tenth** the cost. **EASY TO OPERATE.** No smoke, no soot, ashes, or odor. **Portable!**
30 DAYS' TRIAL!

Write at once for special introductory low price offer. **TRY IT AT OUR RISK.** Prove to yourself that you can have Radiant heat at 1 1/2¢ an hour. No obligation. Send now.

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Write quick for territory and Outfit Offer.

DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address

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Rheumatism

Relieve Pain
in Few Minutes
or Money Back

To relieve the torturing pain of Neuritis, Rheumatism, Neuralgia or Lumbago in a few minutes, get NURITO, the fine formula, used by thousands. No opiates. Does the work quickly—must relieve cruel pain to your satisfaction in a few minutes—or your money back. Don't suffer. Don't delay. Ask your druggist today for trustworthy NURITO on this guarantee.

CLAMPS

The biggest need in most home workshops is more good clamps—clamps for gluing, holding, drawing-up and for setting-up work. They are the extra hands for the 1-man shop. Don't squall or delay work for want of clamps. From over 40 types of clamps we have selected these as the first for homecraft use.

ADJUSTABLE CLAMP CO.
"The Clamp Folks"

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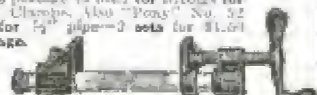
PONY Miniatures 8 types 1" to 2 1/2" cap. Not torn but fine tools with 100 uses.

PONY "50" Fittings go on ordinary 1/2" pipe. Any length. Send \$3.00 plus postage in time for fittings for two "50" Clamps. Also "Pony" No. 32 Fittings for 1/2" pipe—2 sets for \$1.00 plus postage.

Catalog **FREE**
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Jorgensen Hand-screws
Genuine "Jorgensen" Hand-screws grip at all angles, never slip, split or loosen. All sizes. Send \$3.25 plus postage (U. S. A.) for 2 No. 1 Hand-screws—open 6".



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The 1940 Constantine Catalog makes available most complete source of fine woods. Packed with valuable useful facts, some not previously published. Gives free loaning details of our new educational motion picture for woodworkers. All who work with woods need it. Send 10¢ stamp or coin today.

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ALBERT CONSTANTINE AND SON, INC.
791A East 135th St. New York, N. Y.
The Craftsman's Headquarters for Fine Woods

SAVE MONEY ON CAMERAS

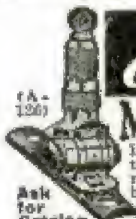
by sending for the outstanding list of camera bargains ever published . . . write for the latest

BASS BARGAINGRAMS

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Bass CAMERA CO.
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Fastest Sighting Combination Known

MARBLE'S Flexible Rear Sight and Sheard Gold Bead Front Sight

Look through peep to gold bead and center instantly on target. Coil spring keeps rear sight in true shooting position. Can be locked down. Interchangeable blades. Price, \$4. Gold front sight that never blurs. Price, \$1.50. Give make, model and rifle cal.

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A real money maker for farm or factory. Uses cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.



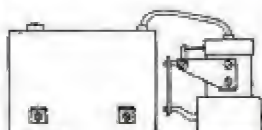
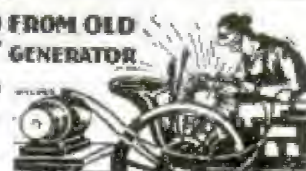
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Make Money—Start a wood sawing business—turn spare timber into cash. Cash or Terms—Engine and Saw Catalog.

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BUILD AN ARC WELDER FROM OLD GENERATOR

WE SHOW YOU HOW
For light or heavy work. 75-200 amps. 35¢ brings complete PLANS. 100 other generator changes.
LEJAY MFG., 1347 LeJay Bldg. Minneapolis



A **DEPENDABLE STEAM ENGINE** for boat models up to 30" in length. Model SE-3, a two cylinder, slide-valve type. Bore 5/16", Stroke 1/4", Length 7", Width 3". Height 3 1/2". Price complete ready to run with burner and propeller . . . \$3.00. Postage extra, shipping weight 1 1/2 lb.

SHAWNEE ENGINE CO.
Box 162, Station D, Cincinnati, Ohio

BUILD YOUR GRANDFATHER CLOCK

The Simple Sensible Red-I-Kut way as thousands have. **DIME** brings PLANS and sixty pictures "HOW" Book pricing many fine brass, eight Westminster, tube chime, electric and battery movements showing nine beautiful colonial grandfather cases. **WHY WAIT LONGER!**
KUEMPEL CHIME CLOCK CO., Bldg. 34, Guttenberg, Iowa.



The Band Steals the Show

(Continued from page 651)

versity band, spends approximately a month before the first practice making his selections of men, then starts daily drills in the formation of letters and school symbols to be used on the gridiron. Each Monday morning throughout the season brings a new formation to be memorized and prepared for Saturday's game. At Butler a "board of strategy," composed of key men in the band, goes over the week's formation with the director before he calls other band members for practice. Members of the band are given their respective positions in the diagram or letter to be used and the remainder of the marching organization is then called in for rehearsal. With the board of strategy to guide them, Butler's "Boys in Blue" have little trouble picking up the new "act" for Saturday's show. By Thursday the band is ready for a dress rehearsal.

Stunts for an entire season are worked out in advance at most schools. Charts are prepared, mimeographed, and distributed so each marcher knows on just what yard line he's supposed to be at a specific time, and where to go from there. Michigan's spectacles are hatched on a table top on which is marked a scale model field. The drill master and his assistants have 120 toy soldiers which they place on the table to show where each man should be at every stage in the formation.

Apart from the football trips—and at the larger schools that means an occasional transcontinental jaunt—a university band will travel 3,500 to 9,000 miles a year.

An extra dash of showmanship has been sprinkled into the band pageants by increasing the number of drum majors with twirling batons. Their rise has been rapid the last few years and some bands are now using as many as twenty. The sure-fire bit of business of tossing the baton over the goal posts just before the band counter-marches has been done to death so the drum majors concentrate on making a mighty toss of the gleaming stick—fifty feet high—and catching it with one hand.

But the person most anxious to see the stunt go off without a hitch, apart from the drum major himself, is the football coach. A superstition has grown up among them that if the drum major flubs his catch and drops the baton, his team is sure to lose.

Everybody was sure
GHOSTS
were loose in our house

Then I told them about my
New RCA
ELECTRONIC LAB



With it I not only perform mysterious stunts—But can build my own radio—My own telegraph practice set—My own radio announce system—It's just packed with fun and thrills!

RCA Electronic Labs have won the cheers of thousands of real boys—and their Dads, as well! For these Labs mean hour after hour of thrilling, exciting fun. And the Lab's parts may be used over and over again, for the construction of a variety of devices.

Just think! With an RCA Electronic Lab you can build your own Magic Relay—and that means a barrel of laughs. For with it, you can keep the whole family guessing by mysterious ringing bells, turning the radio on and off—and doing many other puzzling and amazing stunts. In addition, you will have a grand time constructing your own radio receiver and your own telegraph practice set, as well as an announce system for talking through the family radio.

Yes sir! All the adventure of electronics is yours with one of these fascinating new Labs. And while you're enjoying yourself—you'll be getting valuable knowledge too. So see the RCA Electronic Labs today. Available in two models. Priced from \$7.50.* All parts are genuine. On display at your RCA Victor Dealer's—or wherever toys are sold!

For finer radio performance—RCA Victor Radio Tubes
Trademark "RCA VICTOR" Reg. U.S. Pat. Off. by RCA Mfg. Co., Inc.
*Prices f. o. b. Camden, N. J., subject to change without notice.

Put on your own radio dramas...with sound effects!

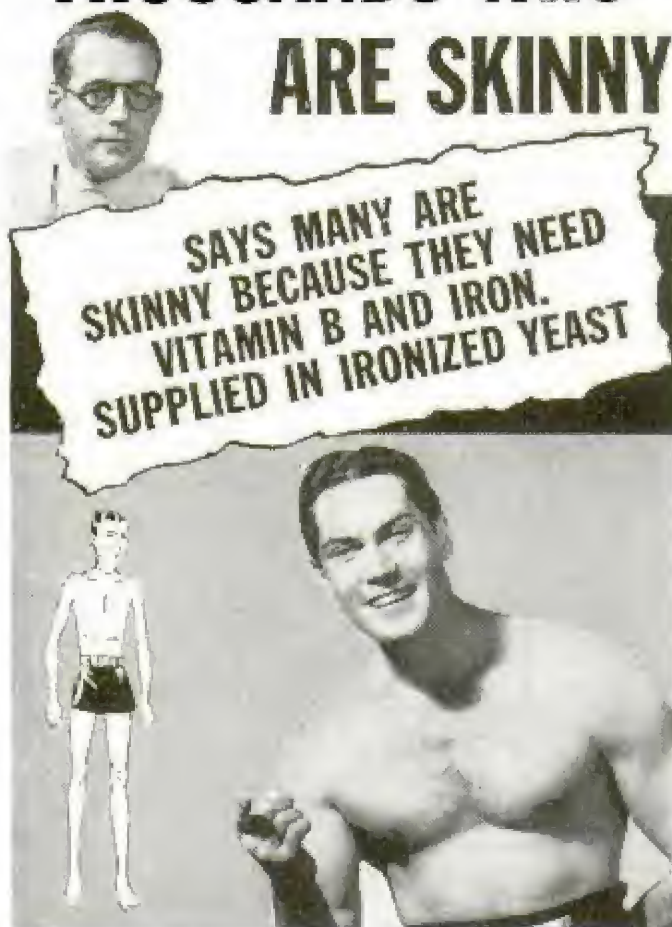
SEE NEW RCA SOUND CONTROL STUDIO



ELECTRONIC LABS
AND SOUND CONTROL STUDIO

By-Products Division, RCA Mfg. Co., Inc., Camden, N. J.
A Service of the Radio Corporation of America

GOOD NEWS FOR THOUSANDS WHO ARE SKINNY



Posed by professional models

Read how thousands of thin, nervous, tired people have gained 10 to 25 pounds, new strength—quick!

SCIENTISTS have discovered that thousands of men and women are thin and rundown—often tired and nervous—sometimes just picking at their meals and sleeping poorly at night—simply because they do not get sufficient Vitamin B and iron from their daily food. It has been found that without enough of these two vital substances you may lack appetite and not get the most body-building good out of what you eat.

Now you can get these exact missing substances in these scientifically prepared, easy-to-take little Ironized Yeast tablets. And if you need these substances, the improvement that comes in a short time is often astonishing. Thousands report gains of 10 to 25 naturally attractive pounds in just a few weeks! Their tired feeling and jitteriness seem to have just flown away. They enjoy their food, sleep fine and get up in the morning full of pep. They're entirely different, much more attractive persons, easily winning many new friends and enjoying life as never before.

Make this money-back test

Get a package of Ironized Yeast tablets from your druggist today. If with the first package you don't eat better and FEEL better, with much more strength and pep—if you're not convinced that Ironized Yeast will give you the new normally attractive pounds, new energy and life you've so long wished for, the price of this first package promptly refunded by the Ironized Yeast Co., Atlanta, Ga.

But just one warning! Many cheap, inferior substitutes for Ironized Yeast have sprung up which do not give the same results. Insist on the genuine. Look for IY stamped on each tablet.

Special offer!

To start thousands building up their health right away, we make this special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating book on health, "Facts About Your Body." Remember, results with the first package—or money refunded. At all druggists, Ironized Yeast Co., Inc., Dept. 5311, Atlanta, Ga.

TUNE IN ON JOHN J. ANTHONY'S GOOD WILL HOUR. See your local newspaper for exact time and station.

No "Blind" Driving in 1940 Cars

(Continued from page 647)

eleven inches for the driver's elbow room. Both front and rear cushions are constructed of coiled springs topped with a thick layer of foam sponge rubber. Buick, LaSalle, Cadillac and the other General Motors divisions also offer one or two "torpedo" models, usually as an addition to the line, rather than as a substitution. The "torpedo" body is the outgrowth of Fisher Body's experiments with a similarly shaped body on the Cadillac "60 Special" last year.

Chrysler Corporation, in Plymouth, Dodge, DeSoto and Chrysler, introduces longer wheelbases to improve the ride, but



DeSoto's four-door touring sedan. Below, its out-flaring rear body contours

in most cases does not increase the over-all length. This results in retention of easy maneuverability. By moving the rear wheels several inches to the rear and the engine several inches forward in relation to the wheels, the Chrysler-made cars are designed for more comfortable riding. The passengers now ride between the two axles, the rear seat being completely ahead of the rear wheels, much closer to the center of car weight where motion caused

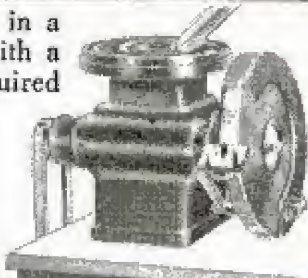
(Continued to page 144A)

KEEP YOUR TOOLS SHARP!

Oilstone your cutting edges in a fraction of the time—and with a fraction of the effort—required by hand.

The TOOL DRESSER

Revolving Oilstone and Emery Wheel combined.
SEE YOUR DEALER
Literature Free.



CLAUSING MFG. CO. - OTTUMWA - IOWA

TYPEWRITER 1/2 Price

Easy Terms
Only 10c a Day
Save over 1/4 on all standard office models. Also portables at reduced prices.

SEND NO MONEY

All late models completely refinished like brand new. **FULLY GUARANTEED.** Big free catalog shows actual machines in full colors. Lowest prices. Send at once. Free course in typing included.



International Typewriter Exch., 231 W. Monroe St., Dept. 1101 Chicago

CHRISTMAS CARD PRINTER KIT

ONLY \$1.50 COMPLETE
INCLUDES: SILK FRAME, ORGANDY, STENCIL, TACKS, TAPE, & SQUEEGE
COMPLETE AS SHOWN



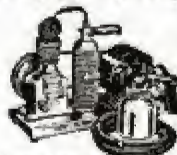
VEL-SUEDE FLOCK KIT

KIT INCLUDES: GUN... 3 COLORS... ONLY \$3.30 COMPLETE
BINDER... 3 COLORS VEL-SUEDE... BRUSH

SPECIAL COMBINATION—BOTH KITS SHOWN ABOVE—\$4.50

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NOBODY PUTS IN
ANTI-FREEZE BEFORE
CLEANING OUT WITH
SANI-FLUSH!

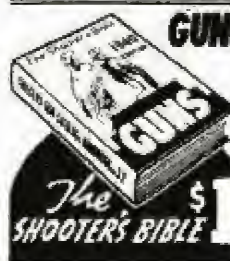


Before you put in anti-freeze, be sure your radiator is clean. Clean out the rust, sludge and sediment that are clogging the delicate veins of the cooling system. You can do it yourself with Sani-Flush for 10c (25c for the largest trucks and tractors).

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(Continued from page 142A)

by road irregularities has least effect. New frames, constructed for greater rigidity, bring down the floor levels, producing a low center of gravity for greater stability. The Plymouth now boasts a wheelbase of 117 inches and a body with an inside capacity twelve cubic feet larger than last year's models. All body styles are offered with or without running boards. Plymouth also has a full-width, straight rear door, eliminating the "dog leg" section around

(Continued to page 147A)



Top, Dodge's Luxury Liner Coupe for four. Below, Hudson's driving compartment with two-spoke steering wheel, and Cadillac-LaSalle front compartment. Bottom, left, at wheel of 1940 Pontiac. Right, Plymouth's instrument panel

"Get a Pair of -

GET 'EM WET-
THEY DRY OUT SOFT
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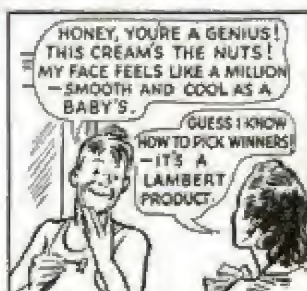
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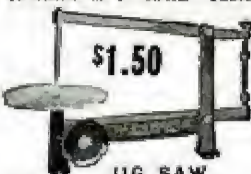
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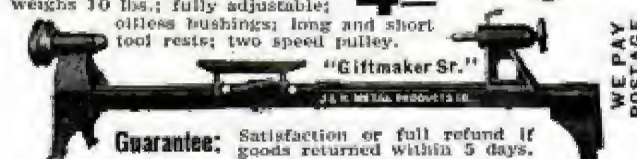
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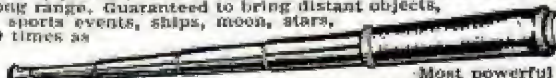
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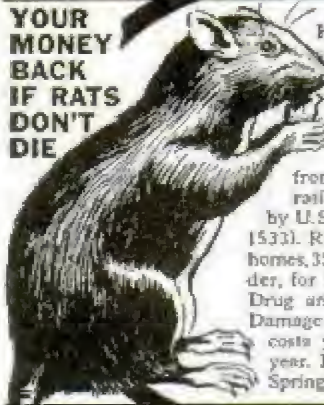
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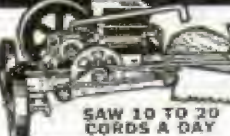


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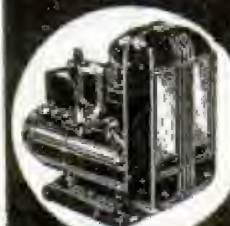
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(Continued from page 144A)

the rear fender contour and giving wider space for easy entrance and exit. Door latches are of the rotary type. The Chrysler, in all models, is longer, lower and more roomy. Horsepower in the "Royal" and the "Windsor" has been increased from 100 to 108 and in the "Crown Imperial" to 143. The "Fluid Drive," introduced last year, is standard on the "Crown Imperial" and is optional equipment on two other models. Running boards or side shields to replace running boards are optional at no extra cost.

Paced last year by Nash, with its "Weather eye," Studebaker, with its Climatizer method of conditioning air in the car, and Hudson, with the Weather Master, the industry turns its attention to im-



Nash's dual "arrow straight" steering system makes driving much easier

provement of heating systems. General Motors offers defrosters, airscoops and a new under-the-seat heater that from its central position beneath the front seat distributes warm air evenly throughout both front and rear compartments. Capacity is considerably greater than that of dash-mounted units. In some cars, the system incorporates two large fans which distribute the air from an extra-large heating element. In the Buick, a large hose conducts fresh air from the radiator back through the engine compartment to the passenger space. Chrysler introduces a twin-heater system that draws fresh air into the car at 200 to 300 cubic feet per

(Continued to page 149A)

That's Gold

—in my
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Hundreds of
Driver-equipped
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profit as well as a lot of fun!

It's a cinch to make money on your investment in Driver Power Tools. All around you are folks who want things made . . . who'll be glad to pay for the furniture, knickknacks, etc. you enjoy making. Try it! Driver Tools will prepare you for BUSINESS . . . enable you to turn out "professional" work that SELLS. Enable you to do it so easily that your "Business" will remain FUN for you.

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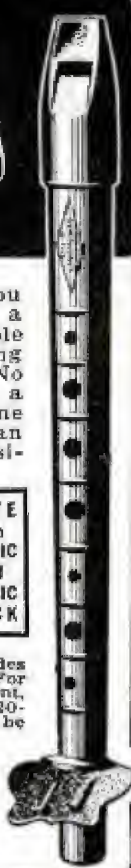
If you can whistle a tune—you can play sparkling melodies in a few minutes on this remarkable new musical instrument. No long course of expensive lessons. No months of tiresome study. Just a few minutes' practice—and anyone from children to grown-ups can play real songs in pure rich musical tones.

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The Symphonet has two full chromatic octaves of clear, flute-like tone quality. Made of black polished plastic, measures 12" long—with special ridges that make for easy fingering. Has adjustable mouth piece and easy-reading music-holder. Notes are spaced comfortably for adults or children. Provides wonderful pre-training for clarinet, flute or oboe. For complete Symphonet outfit, including instrument, music-holder, numbered instruction sheet, and 20-page book of music—send only \$1. Outfit will be mailed postpaid. (Or send no money and pay postman \$1.00 plus postage on arrival.) Either way satisfaction guaranteed or money refunded. For many hours of musical fun—order TODAY!

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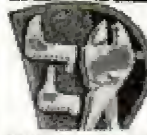
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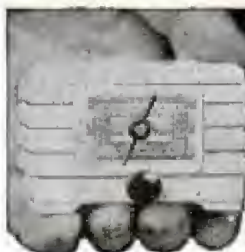


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Midget radio fits your pocket or purse. Weighs only 4 ozs. Small as cigarette package! Receives stations with clear natural tone. "PATENTED FIXED CRYSTAL"—NO UPKEEP—only one moving part. WIRELESS, TUBELESS, BATTERYLESS. ENTIRELY NEW PATENTED DESIGN. Has enclosed geared luminous dial for perfect tuning. Many owners report amazing reception and distance.

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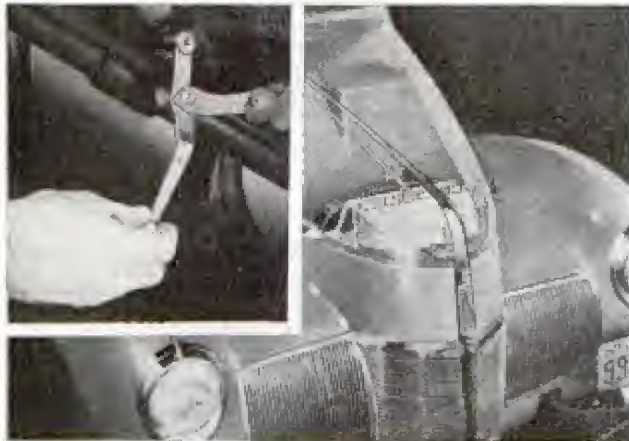
WE BUY and put you in touch with other markets. Catalog and copy of magazine 10c. Or send 25c for Book Catalog and Price List and Year's Subscription to the **AMERICAN SMALL STOCK FARMER. OUTDOOR ENTERPRISE CO., BOX 919, NEW CITY, N. Y.**

When writing please mention Popular Mechanics

(Continued from page 147A)

minute. The intake houses an air filter and rain separator. Cleansed air is conducted to heaters, one on either side of the car. Hot water entering the heaters from the engine warms the fresh air and motor-driven fans force it to twin air outlets built into the sides of the body cowl just ahead of the front doors. From there the warm air is blown into the front compartment and past the front seat ends into the rear compartment. This system is available on all Chrysler cars, starting with Plymouth.

Hudson enters a new car in the lowest-price field, a six-cylinder model that has independent front-wheel suspension with "Auto-Poise Control," which applies correctional influences to help hold front wheels on their course. A new "Eight" which delivers more than one horsepower for every inch of wheelbase, is a further



Illustrating Studebaker's hood lock with steering-column lever (shown inset)

development of Hudson's high power-to-weight engineering practice. Directional safety signals, an improved hood controlled by a dash-locking lever, longer rear springs which have a lower-ride frequency to increase comfort, a separate odometer dial with magnifying lens for checking mileage with unusual ease, a two-spoke plastic steering wheel and silver-plated headlamps, lighting switches, fuse and fuse holders, as well as other important terminal connections that are exposed to weather, are other features of the new Hudson line.

Studebaker, starting with the popular "Champion" introduced a few months ago, is stressing safety features in 1940. Visibility is greatly increased, door hinges concealed and handles streamlined into

(Continued to page 151A)

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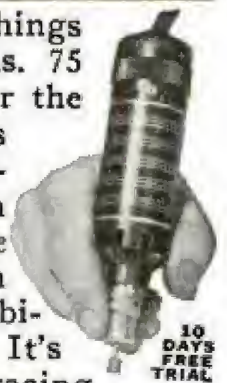
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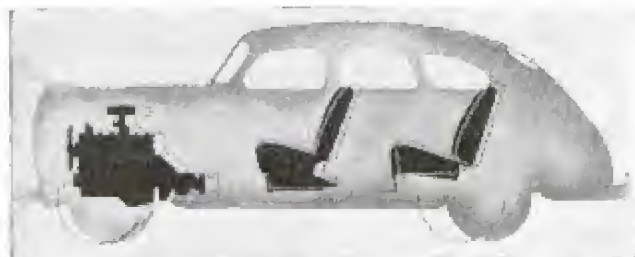
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Alkalize with
Alka-Seltzer

(Continued from page 149A)

the chrome body molding, and the hood is held closed by a locking lever on the instrument panel. All models are marked by the absence of protuberances on the exterior, the result of a design calling for clean, smoothly flowing body contours. Interiors present a new charm, there being a deft use of chromium, which along with stainless steel, colorful plastics and broad-cloth upholstery, helps to create an air of luxurious comfort. Free wheeling and overdrive are available on all models.

Due to the extra load imposed on the electrical system by the sealed beam headlights, which have higher-powered bulbs than previous headlights, capacities of generators have been increased generally. As an example the Buick is equipped with a shunt-wound generator, with both voltage and current regulators, which provides a



How different location of Plymouth's wheels moves passengers toward easier riding position

maximum output of thirty-three amperes hot and forty-two amperes when cold. Larger output at low speeds is a feature.

Announcing price reductions of \$20 to \$50, Nash introduces eighteen models and bids for the low-price market with the 117-inch wheelbase "LaFayette," powered by a ninety-nine horsepower engine. "Arrow-Flight Ride," the result of the combination of long, synchronous springs and super-size shock absorbers in the rear and soft, individual coil springing on the front wheels, is a major feature. A new steering arrangement which helps to hold the car straight on the road contributes further to riding comfort. Nash has flowing streamlines expressive of movement, even when the car is not in motion. Special sound-proofing insulation, consisting of grains of sand suspended in a compound, is scientifically applied to reduce interior car noise. The insulating material deflects sound waves, thus forming an anti-noise barrier wherever it is applied, beneath the

(Continued to page 153A)



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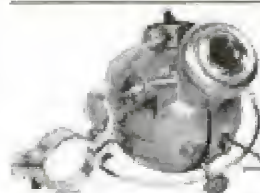


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THE LUX COMPANY, Dept. M-51, Elkhart, Ind.

(Continued from page 151A) 99 36

floor and at every point where the body is attached to the chassis.

Offered as the lowest priced full-size automobile on the market, the new Willys has smooth flowing lines, headlamps molded into fender contours and tubular frame front seat with silent comfort springing. Running boards are omitted. Wind stream ventilation control, two-spoke steering wheel, remote control gear shift and softer springs are other features. Passengers will note the amplitude of headroom.

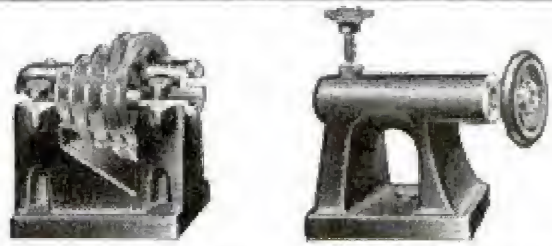
Front ends of the new LaSalle feature further development of the narrow radiator grille, with headlamps moved to the fenders. Cadillac front ends have long hoods tapering to the pointed radiator which is the centerpiece of a three-part grille, with headlamps on the sides of the hood. Optional color choices to make dash panels, garnish moldings and plastic control knobs harmonize with upholstery is an innovation. Directional turn indicators are standard on both cars. The LaSalle "Special" and Cadillac Fleetwood "72" are additions to the 1939 lineup. New styling is reminiscent of the "torpedo" shaped Cadillac "60," previously introduced.

Two completely new cars have been added to the Packard line—the "160" and the "180." Radiators throughout are much narrower and are flanked on each side by additional chrome-plated grilles. The top of the radiator shell has been rounded with sleek curves and a big addition to its depth gives the whole car a longer, more graceful appearance. The engine in the two cars added to the line develops 160 horsepower at 3,500 revolutions per minute. The crankshaft is completely counterbalanced and has a high finish from end to end. Big gains in power-to-weight ratio give these cars a new peak in performance.

Styling of the General Motors cars is closely similar throughout the respective divisions, with the large front fenders flaring rather high into the hood. Buick supplies a good example of the distinctive manner in which the headlamps have been inset into the fenders. They are slightly closer to the outside of the car than previously, but not so much as to give the car an ungainly wide appearance, nor to allow them to be easily damaged when the fender is dented. Their height above the

(Continued to page 155A)

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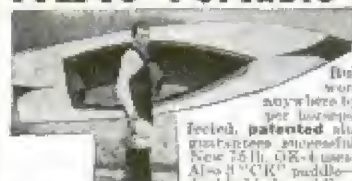
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(Continued from page 153A) *9-9-36*

ground is sufficient to provide adequate illumination even with the down beam. Assembled on top of the fender is the new parking-direction signal lamp. When the direction signal lever is operated to indicate a left turn, lights flash in the direction signal on the rear of the car and the left front fender light. When the car has completed the turn, the signal lamps automatically are switched off, the control lever returning to neutral position. Buick has adopted an antenna located in front of the windshield center post. It can be rotated 180 degrees downward or upward by a control within the car, the upward position being for distant reception.

Another innovation on the Buick is a jack consisting of two units—a jack with handle and a supporting unit. The jack is applied to the outside of the wheel, the rim of the wheel fitting into a special lug. The jack then raises the wheel, after which the supporting unit is slipped under the axle behind the wheel by means of a handle and the jack is removed, permitting easy removal of the wheel and tire.

Chrysler Corporation's styling is well illustrated by the Dodge, whose massive front fenders blend admirably with the body contours. Headlamps are mounted in the fenders, set apart the full width of the car. Front door hinges are concealed and all doors have rotary locks. Sponge rubber seals encircle the inside of doors to eliminate drafts and to prevent rain from entering. Fenders, sheet-metal parts and the entire body are rustproofed. A novel feature provides that when gasoline approaches exhaustion, oil pressure drops, engine temperature rises too high or the generator output lags behind consumption of current, a red signal, glowing under the particular indicator, gives timely warning during night driving. Dodge's wheelbase is 119½ inches. Important in Chrysler construction is "Superfinish," a glass-like surface imparted to metals by special machining, which is applied to many parts. A Superfinished surface in contact with another Superfinished surface, when properly lubricated, will show practically no wear over a protracted period of time, due to the virtual elimination of metal-to-metal friction. The finish is being applied to moving parts and braking surfaces throughout the corporation's four lines.



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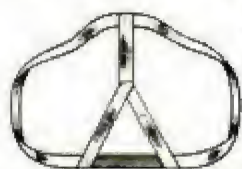
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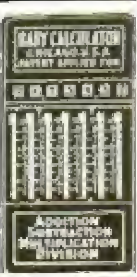
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Keeping the Iron Horse on Time

(Continued from page 670)

switches. Henceforth the engineer is governed by signals, first from the tower, then by automatic blocks when out of the terminal. Along the line he must check landmarks against his watch. He's due at the next station not two minutes ahead of time or three minutes late, but on the dot.

Once the train gets under way, the dispatcher is notified. His job is to keep dozens of trains moving, and on time. At his ear is a headset or loudspeaker. In front of him is a switchboard, beside him a telegraph receiver and key. The telephone crackles or the telegraph clicks, and he makes entries in black ink on a huge train sheet, as operators all up and down the line report the passing of trains. As long as he uses black ink, things are running smoothly. Trains are on time, passings are being made at predetermined points. But some unforeseen emergency arises, and a train drops behind schedule. The dispatcher begins writing orders in a book, while at the same time barking them into the phone. He is arranging new passing points, reshuffling trains, trying to fix things so the late train can make up lost time, so it will not delay other trains.

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(Continued to page 159A)

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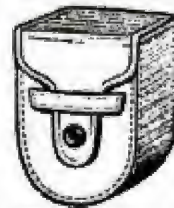
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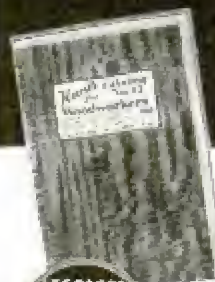
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(Continued from page 157A)

emergency repairs, and the dispatcher's job becomes immediately complicated. That part of the line becomes one-track for the time being.

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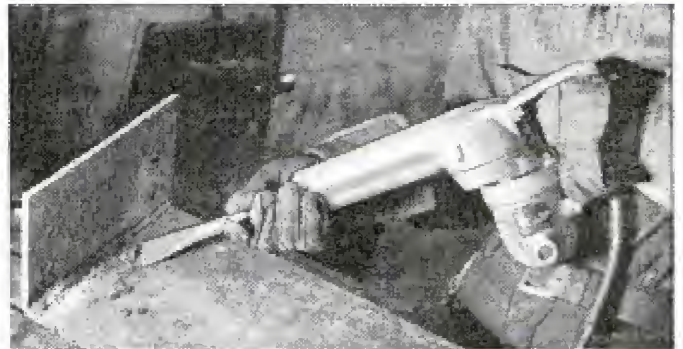
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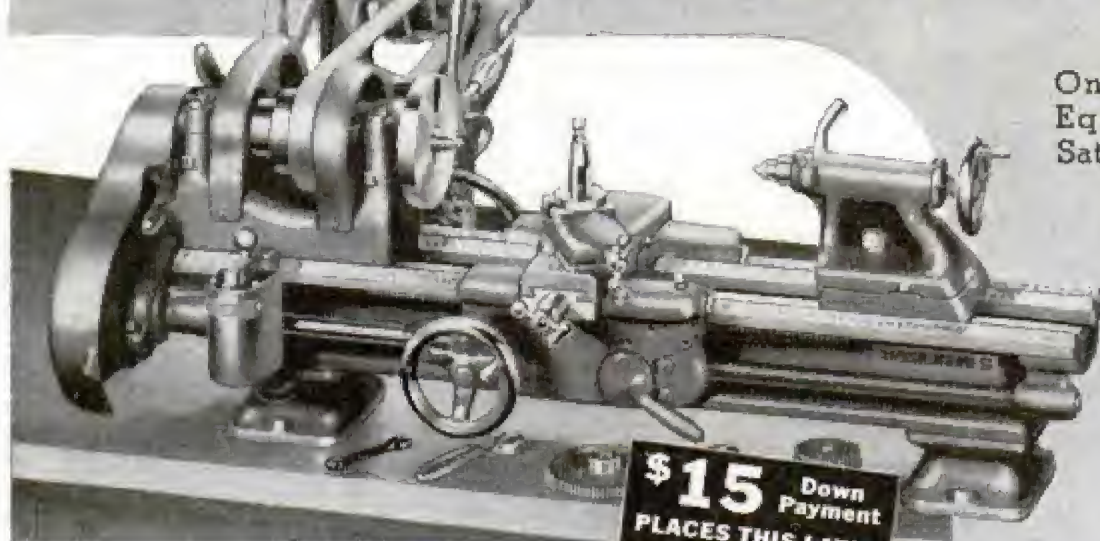
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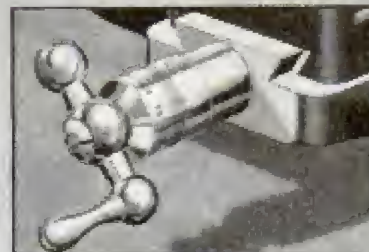
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3 "I landed waist-deep in the wide mouth of a river. Marooned by deep water on all sides, I grabbed my flashlight, and—despite the soaking—it worked! Guided by its beam, two fishermen eventually found and rescued me—thanks to 'Eveready' fresh DATED batteries—which (Signed) *C. W. Harbert* you can depend on in emergencies!"



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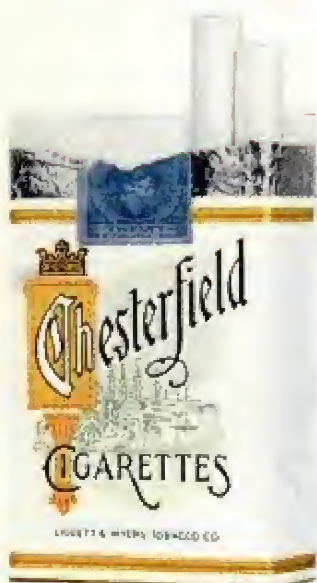
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